BLUE BOOK

JUNE 1944

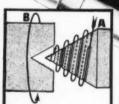
For COOLER Machine Tooling

Use 🕼

Helical Groove

CENTERS

AND
CMD CENTER POINT
LUBRICANTS



Arrow A shows flow of lubricant around helical groove to point of center.

FREE

OIL SAMPLE

Write on your company letterhead for circular on CMD Helical Groove Centers and FREE sample kit of one tube of CMD Center Point Oil and one tube of CMD Center Point Lube (grease).

CHICAGO MANUFACTURING & DISTRIBUTING CO. Dept. 6BB, 1928 West 46th Street, Chicago 9, Illinois



Now two operators with seven Marvel Saws supply the entire plant with billets cut to exact size from bars up to 18" x 18" square. In addition to their present MARVEL Saws, five of which are illustrated above.

x 26" cross section.

Our local MARVEL Sawing Engineer will gladly call at your plant, study your metal cutting problems and make recommendations as to methods and equipment. Write for new Catalog.

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"The Hack Saw People"

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A ONE MACHINE TOOLROOM WITH GUARANTEED PRECISION

RIVETT

The Rivett No. 608 is a super-precision, back-geared screwcutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of parts within the closest precision limits.

Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.

Write for Bulletin 608

Staranter The Road 500 of form or beer tilde 0,0001" in all inclose—water a wider 0,0001" in the inclose wider of 0,0001" in the inclose of 0,0001 in the inc

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS., U.S.A.

HARDINGE

High Speed Precision

LATHE

is designed for accurate tool room work

esigned to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range lound in every tool room. laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use. Hardinge Precision Lathes are being installed in ever-increasing numbers.



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EVEN THE NEW APPRENTICE STARTS WITH A "WORLD" OF EXPERIENCE

Even the "greenest" operator starts with a world of experience if you furnish him with the correct ARMSTRONG Tool Holdwith the correct AFMSTRONG Tool Moleers. His cutter with a MSTRONG Tool Moleter will have the requisite rigidity or resiliency—if it's a thread-cutting operation
the cutter form will be exact and accurate,
and he will be able to operate at speeds
and feeds unheard of a generation ago.
Used in every 96% of the machine shops
and tool rooms of America, in all parts of
the world wherever metal is machined,
ARMSTRONG TOOL HOLDERS embody
the world's experience in cutting tool design, developed, refined and proven by
ARMSTRONG'S 50 years of specialization
in cutting tools for lathes, planers, slotters
and shapers.

and shapers.

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ARMSTRONG

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

Published Monthly

Volume 40, No. 6

JUNE 1944

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a Suggestion to owners of

RODING MACHINES

... for training your New Essential Workers Easier and Faster

Production requirements in this critical war year are shifting men from non essential to essential work. Most of them are not mechanically iminded.

It is the responsibility of war plants to make them productive employees as quickly as possible . . . so we suggest that you train them to operate Bodine machines.

Here are sound reasons for such action:

- Bodine automatic operation can now be taught in weeks instead of months.
- Men and women of fair intelligence have quickly reached high production rates of accurately made small parts.
- Damage to machines, tools and the work is prevented by automatic protective devices . . . which also protect the operator.
- Operating Bodine machines is clean, healthy work . . . at low fatigue factor . . . a major contribution to the defeat of absenteeism.
- Bodine operators clearly see how well they fit into war work... are contented with their effort to help win the victory.

This procedure may permit advancement of your older experienced operators to more difficult jobs...for improved all-around production.

Please feel free to ask advice from Bodine Engineers on new setups or changeovers of your enachines for new or added duties.



DRILLING, MILLING, TAPPING, SCREW INSERTING Timultaneously

BODINE does this:

- Builds 6 standard models and develops the particular tooling for the work to be done.
- Permits Milling, Drilling, Tapping, Screw Inserting, one or all operations, during one cycle of the dial... with manual or hopper feed... manual or automatic ejection, depending upon the nature of the part processed.
- Allows for the greatest flexibility in tooling set-ups for an extremely wide range of work.
- Electrically protects machine, tools and work from damage . . . insures safety to operator.
- Provides a compact design in all machines, which cuts floor space requirements to 54 x 60 for the smaller . . . 90 x 96 for the largest size.





Accurate radii and spherical

added to



variety of

The device illustrated above...a Radius Truing Attachment for CINCINNATI No. 2 Centerless Grinders... is a typical CINCINNATI engineering application of the Centerless method to a wider variety of parts requiring precision grinding operations. This attachment offers several grinding wheel truing possibilities:

- 1. Truing corner of wheel, 0 to 3/4" radius.
- Truing convex crown on narrow wheels, 90° included angle, 0 to ³/₄" radius, where W (max.) = 1.4 R.
- 3. Truing concave radius in wheel within a definite range grouping. (5/32" to 9/32", 9/32" to 13/32", 13/32" to 9/16", 9/16" to 3/4", 3/4" to 1", 1" to 11/4", 11/4" to 11/2").
- Truing concave radius in wheel, any radius desired from 5/32" to 1½", with interchangeable blocks.
- Change from convex to concave truing with interchangeable elements.

The attachment may be affixed to the wheel guard to suit the width of wheels being used, and, in addition, it has a 2" cross adjustment for positioning the diamond. The unit may be attached to any CINCINNATI No. 2 Centerless Grinder, right in your own shop. Additional details will be sent on request.



sections

centerless work

Capacity, convex 0 to 3/4" radius-up to 90° included angle.



Convex Truing-



Convex Truing-

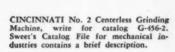


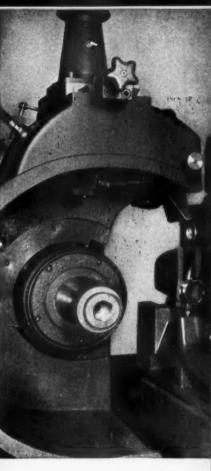
Convex Truingoutside corner.



Concave Truing (with additional equipment).









MODEL 340 FOR SMALL PARTS



MODEL 350 LATHE ATTACHMENT

LAMBERT SUPERFINISHERS

are built in three models, each to do a special job. Complete new catalog describes them —ask for it today.

Superfinishers



LAMBERT MODEL 340 SUPERFINISHER

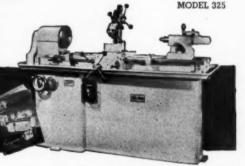
The Model 340 is a production machine for small parts. Any lathe tool, milling cutter, reamer, or any other tool that can be ground on a tool and cutter grinder, can be SUPERFINISHED on this machine.

NOW YOUR LATHE — A SUPERFINISHER

A lathe attachment, complete with variable speed, a complete lubricant system including tank, pump and filtration system is now available. Either internal or external SUPERFINISHING heads can be furnished.

LAMBERT MODEL 325 SUPERFINISHER

LAMBERT SUPERFINISHERS are built in three sizes. The Model 325 has a swing over the bed of 14" and 1114" over the carriage with 48" or 62" between centers. It is a completely universal machine for external and internal rounds, tapers, and flats.



OHIO UNITS - Licensed Manufacturers - Dayton 4, Ohio

a drop in time saves... TROUBLE!



PUT SEVERAL DROPS OF OIL IN ALL OIL CUPS TWICE A WEEK!

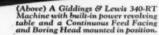
A little oil at regular intervals is the best protection. A lot of oil, too late, won't save an injured part.



Reproductions of this page on enameled paper are available in 8¼" x 10½" size for bulletin-board use in your turret lathe department. Write the Gisbolt Machine Company, 1185 East Washington Avenue, Madison Wisconsin Ask for the conice of "Westing Company of Department" State of westing desired.

Here's the Attachment You Need.

G. & L.
Continuous
Feed Facing
and Boring
Head



These 5 Features Will Increase the Capacity of Your Machine

- 1 Tool Slide has six separate power feeds ranging from .009" to .118" per revolution of head.
- 2 Feed Selector Control is provided for selection of any one of six feeds.
- 3 Directional Control Lover points in direction of tool slide feed.
- 4 Micrometer Adjustment graduated to .001" for tool slide adjustment.
- 5 Two Tool Holders for 3/4" tool bits furnished as standard equipment.





A wide range of standard tools can be used with this attachment and are available. Special tools can be designed and built for specific applications.

GIDDINGS & LEWIS

144 DOTY STREET

to Perform Difficult Internal Operations Like These on Your Horizontal Boring Machine

(Left) A groowing operation is being per-formed in a blind bore. Tool slide is ad-justed until tool enters smaller external justed until tool enters smaller externs bore. It is then set out to proper grow diameter by using micrometer dial. To slide is engaged for grooving.

Internal facing cuts are easily performed on G. & L. Boring Machines equipped with the G. & L. Continuous Feed Facing and Boring Head. In-

of your unusual or difficult horizontal boring, drilling and milling machine iobs with this attachment, and increase both the flexibility and capacity of your machine, send for detailed

ADDITIONAL DATA ... covering the



MACHINE TOOL COMPAN

FOND DU LAC. WIS.



... It's a folder from the Campbell people about their complete range of Abrasive Cutting Machines

· Yes, you will want this folder in your file. It's a sort of digest of the complete line of CAMPBELL ABRASIVE CUTTING MA-CHINES, with references to more detailed catalogs covering each type.

Let this folder serve as a reminder that CAMPBELL engineers are at your service-ready and able to work up cost sheets and practical production procedure for you, based on actual production records of CAMPBELL Machines. They ask you to state (1) materials.

(2) shapes and sizes you are cutting, (3) lengths before cutting, (4) lengths of cut-off pieces and (5) required production per hour.

CAMPBELL ABRASIVE CUTTING MACHINES are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramicssolid bars, tubular and flat stocks.

Write for the above folder-or for information on any specific cutting problem you may have.



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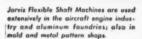
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AMERICAN CHAIN & CABLE COMPANY, Inc.

Harvis Flexible Shaft Machines

Jarvis Multiple-Speed Flexible Shaft Machines make it possible for the metal craftsman, the finisher, and the cleaner to have a universal tool suitable for rotary filing, sanding, grinding, polishing, and buffing. There are Jarvis Flexible Shaft Machines and Tools that wilk satisfactorily meet your requirements.

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Jarvis Tools are made for efficiency and long life. For use with Jarvis Flexible Shaft Machines, in any finishing or cleaning operation.



THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS . FLEXIBLE SHAFT MACHINES . GROUND ROTARY FILES



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We are proud that Buffalo Bending Rolls perform an important job at the Boeing plants, as at most other airplane factories.

If you are not acquainted with the work being done with Buffalo Bending Rolls, write for Bulletin 352.

BUFFALO FORGE CO.

161 MORTIMER ST.,

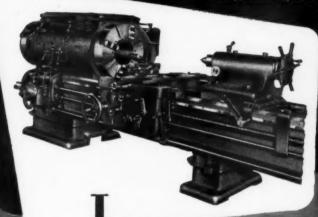
BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd. Kitchener, Ont.



TYPE BENDING ROLLS

For Faster Production. Better Work. Lower Costs-HYDRATROL LATHES



a number of big war plants they are performing important operations in 1/2 to 1/7th the time of previous practice?

ook around your own plant-you may find a number of machining jobs which are a problem to you - jobs which possibly could be done better on a Large Hollow Spindle Type of HYDRATROL LATHE.

Send us prints of these difficult, unusual or too-costly jobs. for a specific, time-and-money-saving recommendation.

FIVE SIZES-18" TO 36"

Small 18" up to 7 1/4" Hole Large 30" up to 14" Hole Medium 24" up to 12" Hole Large . . . 36" up to 16 1/2" Hale



71/8" Hole in Spindle

chmann Machine Company

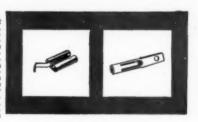


IMPROVED FEED MECHANISM

The suscess of the Mustil Slide Machines for high speed, automatic production of complicated parts is credited to the patented feed ing Mechanism. A close-up view of the Feed on the No. 33 Machine appears above. Operates between definite stops, and advances the stock exactly the same amount at each stroke. Provision is made to definitely prevent any movement of the steek on the return stroke of the Feed.

ADVANTAGES OF SPLIT CAMS

All cams are of the split type, as illustrated above. The advantage is particularly evident in the simlarly evident in the simbe removed without disturbing the shafts of the Machine. Furthermore, when a job has been carfully setup, the split type cam-(and the cam carriers) can be appropriately marked for fast and convenient resetting at a future date. This, and many additional feature of the state of the state of the Bulletin HIS.



FOUR SLIDES WITH CAMS—STRIPPER BRACKET AND CAM—STOCK CHECK AND CAM—DIE HEAD AND CAM—BACK PLATE — MOTOR—REEVES VARIABLE SPEED DRIVE with the No. 25, No. 28 and No. 33 Machines. The capacities and feed are as follows: No. 25—top left—up to 1." wide stock; maximum feed length 4". No. 25—top center—up to 1.5" wide stock; maximum feed length 8". No. 30—top right—up to 1.5" wide stock; maximum feed length 18. No. 33—lower left—up to 2.3" wide stock; maximum feed length 15.5". Detailed specifications in Bulletin HIS; your copy mailed upon request.

U. S. TOOL COMPANY INC., AMPERE (East Orange), N. J.

Builders of the U. S. Multi Slides, U. S. Multi Millers, U. S. Automatic Press Room Equipment, U. S. Die Sets and Accessories. DOUGLAS PRECISION MILLER

for Toolroom and Production

> Size 32" x 8" Plain



THE PRECISION BUILT INTO THE DOUGLAS MILLER



provides efficiency and speed to produce small parts requiring the extreme accuracy essential for war production.

Rigid well balanced design, combined with central control make for easy operation, permits the release of highly skilled labor for other tasks.

A wide selection of speeds meets all requirements for toolroom and production.

There is an ample variety of feeds from which to choose the right feed for material and accuracy requirements.

Timken bearings and helical drive gears are other features to assure a smooth performance. Write today for specifications and prices.

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DOUGLAS MACHINERY CO., Inc.

150 BROADWAY

NEW YORK, N.Y.

Look at the Might in this Midget!



joint has the highest strength-weight ratio of any joint in its class. FACT: It has the highest resistance to vibration and fatigue-failure. FACT: It will withstand temporary axial overloads 80% greater than its rating, and temporary torsional overloads from 60% to 150% greater than its rating without binding.

Basically two things give Apex joints their unprecedented strength, lightness,

and life span: the unique design of the joint and the exclusive Apex cover. The latter seals lubricant in, seals trouble out, reduces wear to a minimum, and in addition cuts fatigueproducing vibration, extending the life of the joint and

safety factors beyond all previous limits.

Five sizes; torque ratings to 10,000 inchpounds; exceed all requirements of current AAF Specification for Class 2 Universal Joints; fully meet AAF Winterization directives. Write for Bulletin No. 103.



Aircraft Universal

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KEEPING



MURCHEY MACHINE & TOOL CO.

DEPT. M-2, Detroit 26, Michigan

PLUG GAGES...IN ANY OF 3 MATERIALS



Providing

THE WEAR RESISTANCE SUITED TO YOUR INSPECTION VOLUME

Plug gages manufactured by Lincoln Park are "mode-to-measure" for your particular inspection requirements. Steel, chrome plate, or Carboloy gages are supplied in accordance with the service life and lasting accuracy demanded in various types of inspection work.

By comparison, chrome plate offers five times and Carboloy at least fifty times the wear resistance of steel gages. Also, by the use of the more wearresistant materials, gages can be specified to much closer required limits. Because allowances for wear can be reduced considerably, your production departments get the resulting benefit of greater manufacturing tolerances.

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Prompt delivery of any type of plug gage you require can be promised by Lincoln Park. See your Lincoln Park sales representative or write directly to the plant.

BUY MORE THAN BEFORE in the 5th WAR LOAN

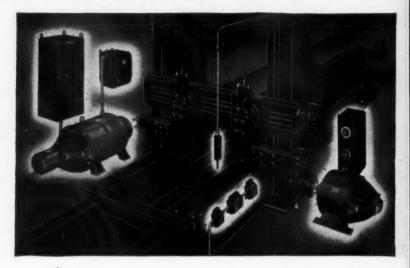


LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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Planing the Humps OFF THE SPEED CURVE

To take lost-time humps out of the speed curve requires close, accurate control, a wide speed range and smooth, quick reversals.

Westinghouse direct-current variable voltage planer equipment does all this—giving more cutting strokes per minute. Standard equipment provides wide variation in speeds over a range of 30 to 1, and includes the patented Westinghouse Rototrol speed control.

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Westinghouse PLANTS IN 25 CITIES OFFICES EVERYWHERI







Grinding rabet, 12" diam-eter, in a motor end bell.



Grinding accurately tapered hole in 10" diam. flywheel.



Grinding concave form hardened steel die.

ABRASIVE No. IG Internal Grinder offers unusual versatility and range for both toolroom and high production work. With longitudinal rack travel of 8" and screw cross feed of 31/4", a wide variety of grinding jobs can be accommodated. Diamond wheel dresser assures accuracy of holes up to 12" diameter. Work head swivels through 360°. Both cross slide platen and wheel head platen are adjustable longitudinally and transversely. Work spindle mounted on super-precision ball bearings, sealed against abrasive grit, assures long-lived accuracy.

Available for Prompt Delivery

Write for illustrated bulletin.



ABRASIVE MACHINE TOOL CO., East Providence 14, R. I.

New SPEED... New PRECISION FOR SMALL THREADED WORK

THE ECONOMIES of the Circular Chaser principle are now available to producers of small threaded parts, with the new

NAMCO "DA" SOLID ADJUSTABLE DIEHEAD

With only three parts, simple and rugged in construction, this die handles work from .056" to .1875" dia., pitches 80 to 20.

One adjustment for fine diametric precision, holds to rigid standards of Class 3 threads. Chasers may be reground through 270° circumference—they last 20 to 50 times longer.

If you cut small diameter threads, the new "DA" is the tool you need. Catalog D 42-A.





THE NATIONAL AGMISCO

AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENDIDS • CENTRIFUGES • CONTRACT MANUFACTURING

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS - SINGLE SPINDLE AUTOMATICS - AUTOMATIC THREADING DIES

RIGHT

PRECISION EXACTNESS ACCURACY

And make it a RULE to consult WINTER ENGINEERS for the right answers for meeting tapping schedules on time.

The RIGHT Tap for the job is important! The RIGHT lubrication! Speed of operation! Properly designed cutting edges! WINTER ENGINEERS can give you the correct answers to these and many other questions; often saving hours of operating time, and increasing tap life. WINTER TAPS are good tops. Handled with care, and kept sharp they will be cutting good threads long after you would narmally expect to discard them.

The NATIONAL TWIST DRILL & TOOL CO.





For light duty broaching or for assembling where pressures up to 4 tons are required, or for light duty straightening, etc., there is no better press than Colonial's new all hydraulic line of "JUNIORS".

Available either in bench a pedestal types and for either push or pull broaching (with special attachment). Capacities from one to four tons. Machined and counterbored platen for easy installation and location of fixtures. Plenty of daylight and clearance. Campact, powerful and sturdy. Remarkably low in cost when you consider the tremendous variety of jobs these presses can do.

For complete technical data write for Bulletin No. VJI-44

colonial BROACH COMPANY

Growther Powerhory Machines, Growthery Europemine



Right-Bench type all-hydravils Junior Press, Also available with variable speed and pressure con-

Left - Pedestal type Junior for press work or broaching. Also evailuble equipped for pull broaching.

NEUBERTBAR TURNERS

Give You These



5/8" NEUBERT

SUPERIOR **FEATURES**

- ADJUSTABLE TOOL SLIDE
- HEAVY ROLLER BEARING ROLLS
- RETRACTABLE TOOL SLIDE
- NARROW WIDTH
- EXTREMELY RIGID
- IDEAL TO USE WITH CARBIDE CUTTERS
- **UPRIGHT POSITION OF** CUTTER GIVES AMPLE CHIP CLEARANCE

5/811

Capacity: 1/4" to 5/4" Dimensions:

Width 2%" Center of shank to bottom

Diam. of shank %" Hole in shank 25/64" Length that can be turned: 1/4" to 3/4" unlimited 25/64" to 5/4" 21/2" Weight 33/4 lbs.

Price \$68.00 F.O.B. L.B.

SOME DEALERS TERRITORY OPEN.

1"

Capacity: 1/4" to 1"

Dimensions: Width 5

Center of shank to bottom 1-13/16"

Diam. of shank 1" Hole in shank 21/32" Length that can be turned: 3/16" to %" unlimited 21/32" to 1" 3"

Weight 91/4 lbs.

Price \$85.00 F.O.B. L.B.

ORDER NOW

13/4"

Capacity: %" to 13/4"

Dimensions:

Width 6½"
Center of tool to bottom
2-11/16"

Dimensions of flange 4" vert. x 43/4" horiz. Hole in flange 1%"

Length that can be turned: %" to 134" unlimited Weight 28 lbs.

Price \$110.00 F.O.B. L.B.

FOR IMMEDIATE DELIVERY

10 day money back guarantee

NEUBERT MACHINE COMPANY

Precision Cutting Tools

341 W. Willow, Long Beach 6, Calif.

from STEM to STERN-

HARGRAVE "Superclamps" ARE "ON THE JOB" IN BOAT SHOPS OF U.S. Coast Guard

Boat-building operations of the U. S. Coast Guard involve extensive use of HARGRAVE Superclamps. In every stage of construction these rugged, forged steel clamps—extra strong for their weight—help speed boat output. Dependable performance such as the Coast Guard requires is assured in HARGRAVE Clamps and Tools by INDIVIDUAL TESTS for strength and durability—under pressures far in excess of their rated loads.

Since 1879, this strict adherence to high quality in materials and work-manship has made HARGRAVE Mechanics Tools the standard of excellence in shops the world over. Today, these "Individually Tested" Tools are in tremendous demand, meeting wardine production needs of every type. It's difficult to fill all orders as promptly as we would like—but we're doing our best, working day and night. See your supplier — he, too, will gladly help.

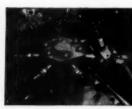
THE CINCINNATI TOOL CO. 4050 Montgomery Rd. Cincinnati 12, Ohio



-- The Patented Collet assures the Precision of



Models 102 and 402 Chucks in use on Automatic Screw Machine.



Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



Collapses 1/32 in.—Retains Gripping Strength and Accuracy,

Collet open at both ends.

Model 201 High Speed Router Chuck with extend nose piece for pattern following.



Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.



Model 301 Chuck designed for high speed internal grinding operations.



Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.



Tool Post Grinder equipped with Model 301 Chuck.



Vertical Milling operation with 101 Chuck.

ERICKSON STEEL COMPANY



ERICKSON PRECISION

COLLET CHUCK

Model "01" accurate within ,0005 or less at the nose,

Model "02" accurate within ,001 or less at the mose.

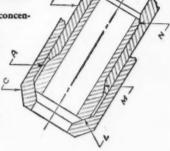
PRINCIPLE

The drawing (right) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.



SEND FOR BULLETIN "E"



Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.

One ERICKSON COLLET will replace 7 standard, single purpose Collets.



Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.

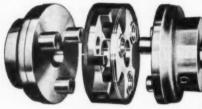
Dept. N 2309 Hamilton Ave., CLEVELAND 14, O.

June, 1944

MACHINE TOOL BLUE BOOK

INGENIOUS NEW PRINCIPLE "O-P" MULTIFLEX COUPLINGS

THREE UNIT SAFETY SMOOTH DESIGN



PATENT NO. 2271568



MULTIFLEXIBLE ELEMENT

Insures

- MULTIFLEXIBILITY
- END FLOAT
 UNOBSTRUCTED
- . NO LUBRICATION
- . SHOCK-ABSORBING
- NO MOVING PARTS
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A MASTER-PIECE FOR PRODUCTION

Our achievement of this ingenious new principle in a MULTIFLEX COUPLING required several years to perfect. Today war production calls for twenty four hour service on all machines—they must be kept going—and the transmission of power becomes a most vital factor. MULTIFLEX COUPLINGS were designed to transmit that power under all conditions. MULTIFLEX COUPLINGS give greater MULTIFLEXIBILITY against heavy shock and pulsating loads in any direction, also compensating for ANGULAR and PARALLEL MISALIGNMENT. So—for insured production order MULTIFLEX COUPLINGS.

AND THE PROPERTY OF THE PROPER

FOR THIS EIGHT PAGE DETAILED FOLDER

132 CHARLES STREET,

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Bellows CONTROLLED-AIR MOTORS



OPEN AND CLOSE VISES
AND FIXTURES, OPERLATCHES AND
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BELLOWS Air Motors reduce manual operations, lessen the need for skilled "feel", speed non-productive travel, lessen worker fatigue, maintain uniform tolerances, effectively increase machine production.

Departing radically from conventional air cylinder practice, the Bellows Air Motor is a complete, self-contained power unit, with valve, operating lever and speed controls, integral parts. Bellows Air Motors are readily incorporated into standard or special machines to perform a wide variety of duties. Operating control, adjustable to "any angle in any plane" may be easily connected and synchronized to the machine cycle.

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SPEED PRODUCTION WITH CONTROLLED-AIR POWER

The Bellows co.

ESTABLISHED 1911

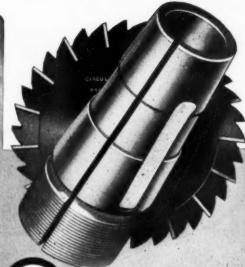
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MACHINE TOOL BLUE BOOK

33







Metal Slitting Saws MAJORITY OF SIZES

AVAILABLE FOR IMMEDIATE DELIVERY!

Slitting a surface grinder front spindle bearing (shown above) is only one of countless operations performed by these Circle R saws.

The Circle R side cut slitting saw is designed to take deep cuts, split chips and eliminate dragging while the Circle R Slitting Saw, with staggered teeth, is for use where deep cuts or heavier feeds are required. The shearing action of the peripheral teeth and more chip clearance on the sides give ,

this latter saw an advantage over the regular side chip clearance.

For complete details and specifications on these and other Circular Saws, send for Catalog K.





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WETMORE Producers



 Wetmore Producers are specially designed for extra heavy roughing and finishing operations—to remove large amounts of stock faster and better. Like all Wetmore products they have features that offer definite advantages where the high production of precision holes is desirable.

The type 41 Wetmore Producer, shown above, is for roughing; type 61, its companion model, is a finishing tool. Wetmore builds modifications of them for special requirements.

When reamers and boring bars are needed on the job Wetmore Tools are the natural answer. See your industrial distributor or write us direct.

Send for the new Wetmore catalog containing complete tool specifications and details together with important data and information you will want.

WETMORE REAMER CO., 418 N. 27th St., Dept. D, Milwaukee 8, Wis.



Scully-Jones Tap Chucks

STYLE "A" TAP CHUCKS have five big advantages for driving taps:

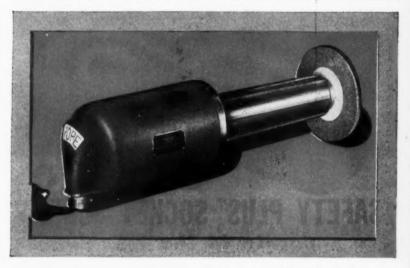
- Drive by the square—giving a positive drive.
- D Centers by the shank—for correct alignment.
- D Spring collet action—for locking tap in chuck.
- Four point bearing giving collet action.
- A tapered shank—fits any MORSE TAPER HOLE.

RECOMMENDED FOR MAXIMUM RIGIDITY AND CONCENTRICITY IN TAPPING OPERATIONS

SCULLY-JONES AND COMPANY

1901 SO. ROCKWELL STREET . CHICAGO, ILLINOIS. U.S.A.

THIS New POPE SURFACE GRINDER SPINDLE





This POPE Meterized Spindle with th new G-E Motor Sealed in and SKF Roller Boarings delivers full 1 H. P. at the wheel

It is designed specially for 6" x 18" surface grinders. It also operates horicontally, vertically or at any angle on boring mills, planers, milling machines and other machine tools for special work.

Has a G-E Motor Sealed In

POPE engineers and GENERAL ELECTRIC engineers, working in collaboration, have produced a new motorized grinding spindle employing a motor designed specifically for operation in a sealed housing. Think what this means in terms of operating efficiency and economy! These Spindles always run at their best, because dust and dirt never get a chance to collect on a fan or in cooling passages causing unbalance and loss of cooling efficiency. POPE Spindles never require operator attention for lubrication or adjustment.

POPE Spindles with their fine craftsmanship, SKF Super-Precision Double-Row Roller bearings and the new Sealed-in construction with G-E Motor produce finer finishes than ever. At the same time they have the power, the bearing capacity and the rigidity for rapid removal of metal when required.

You have only to install one of these new completely sealed units to appreciate what an improvement and what savings it makes. Try it, and see for yourself!

For complete information, get in touch with



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"SAFETY PLUS" SOCKET SCREWS are accurate to the Nth degree

Our socket screw products—all of them—are manufactured from electric furnace, controlled grain size alloy steel, the quality of which is rigidly controlled by our metallurgical laboratory to insure maximum strength in the finished product. Machining on modern equipment and systematic inspection on the latest type automatic gauging devices, results in a uniform product to close tolerances for rapid and accurate fits in assembly.





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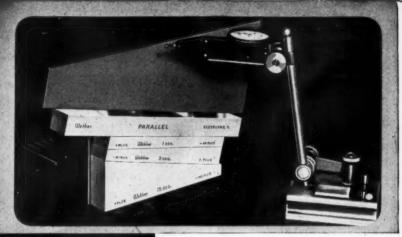


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WHY? .. Because in WEBBER ANGLE GAGE BLOCKS you have the Fastest ... Easiest ... Surest means for precision angle measurement.

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WEBBER ANGLE GAGE BLOCKS are furnished in sets consisting of 14 blocks which produce 370,800 angles accurate to within ½ second of an arc. Angle measurement with these blocks is simple—fast and ultra-accurate. Complete information is contained in a new booklet.

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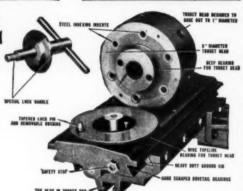
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LYNN BT-2 with Pilot Wheel

For bench or small engine lathes with 9" to 13" swing. 6 positions, 6" head, 51/2" travel, stops for each position. 10 to 1 leverage pilot wheel facilitates smoother cuts, reduces number of operations.



Do Turret Work on Your Present Lathes

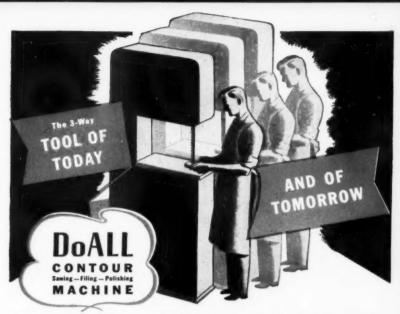
LYNN Heavy Duty, Self-Indexing Bed Turrets give you *immediate conversion* for turret work. Easily, quickly mounted on present idle or unproductive lathes, equipping them to handle multiple operations rapidly on a wide range of work. A model to fit any size and make of standard engine lathes, from 9" to 28" swing. Engineered as smartly and machined as finely as the best turret lathes.

Also, LYNN Bed Turrets for *replacements* on standard turret lathes; LYNN Self-Indexing Tool Post Turrets and Cut-off Cross Slides—a complete line of LYNN Tools to Speed Production.

Distributed nationally through jobbers. Immediate delivery from stock or factory.

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Here is a machine tool you won't have to scrap, convert or re-adjust. Not a heavy, cumbersome machine, but a compact unit that can easily be moved from place to place — wherever rapid machining is required. DoALL does contour cutting, band

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CADILLAC Thread G A G E S

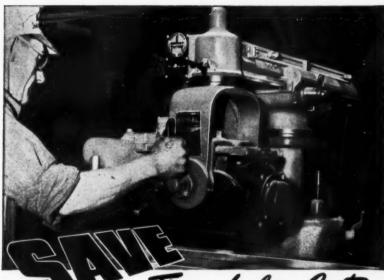
ALL STANDARD SIZES

If you're in a fix because, in the wartime rush of trying to do several things at once, you overlooked ordering Thread Plug or Thread Ring Gages for a particular checking operation, read on and you'll see that your worries are over!

From the large stock-pile that we have built up to meet emergency needs, we can ship you practically any standard size of Thread Plug or Ring Gage as soon as you give us the word. Barring unforeseen events, such as a suddenly increased demand for some particular size, we are in a position to get your shipment off to you the same day your order is received.



CADILLAC GAGR COMPANY, Detroit 5



Time, Labor, Cost
WHEN CUTTING LONG OR BULKY WORK!

Workpieces of wide area often cause costly jams in production lines—unless you speed the work on its way with versatile Walker-Turner Metal-Cutting Radial Machines and Band Saws.

These fast, accurate machines relieve overworked, heavier cutting units, and even serve as "first line" production equipment on lighter work. Their wide range of speeds brings practically all materials within their scope. Their simple, easy operation makes every manhour more productive.

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METAL-CUTTING RADIAL MACHINE

Cutting wide, metal stock is easy with the Walker-Turnic Rodial Machine. Sliding ram design permits transverse travel of 21½". Geared motor—with saw shaft at bottom edge—permits deep cuts with smaller blades than in conventional motors and effects substantial savings in blade costs. Universal head makes mitering and compound mitering, as easy as straight cutting.

METAL-CUTTING BAND SAW

profiling irregular dies . . cutting sheets. rods and tubes of steel iron, aluminum. brass, alloys and compositions —those are a few of the jobs Walker-Turner Metal-Cutting Band Saws are doing quickly, accurately, economically. Available in 14 and 16-inch models, these rugged, compact machines provide a speed range from 61 to \$300 s.f.m.



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METAL-CUTTING BAND SAWS * POLISHING LATHES * FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL * MOTORS * BELT & DISC SURFACERS

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That STEP-UP PRODUCTION





BERKELEY Drives put punch into production schedules by giving you just the right speeds for your tooling. That's important because you need proper speeds to make carbide tooling really effective.

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BERKELEY Drives are built by a Pioneer Drive Specialist who knows every angle of modern Drive requirements.



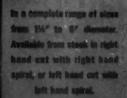
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SHELL END MILLS

Are Now Standard Putnam Tools

A new addition to the line of standard Putnam Hi-Speed cutting tools! Correctly designed and made of the finest high speed steels, these heavy duty shell end mills offer the same fast-cutting, long-lasting qualities typical of all Putnam tools.

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Ganging up

on ONE LONE GRINDER



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(Illustrated) Model 3-F 1 H.P. Queen City Heavy Duty Grinder. A low-cost, ball-bearing grinder of unusual productive capacity and durability . . . built to handle the heaviest loads. Completely equipped, ready for instant use.



Engineered correctly by men with years of experience. Silent operation, ease in striking arc, wide range of application, low initial cost, economy of operation, negligible upkeep, burn-out proof transformers, all go to distinguish K-O Welders. These time-tested units are made to serve their employer well and show him a substantial profit whether on maintenance or production.

20 to 550 amps







Fitting a carbide tool to the work is a job for specialists—and the skill with which the tool is ground is directly reflected in increased production. Kennametal standard tools will handle the majority of usual metal-cutting jobs, but even if their number were multiplied by ten, there still wouldn't be a sufficient variety. For the tool must be fitted to the work not the work to the tool.

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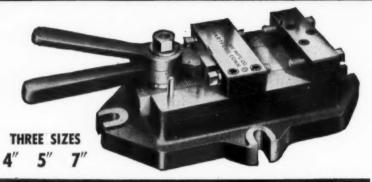
resulting from excessive heat generated by "bearing down" to hasten the grinding process.

When we supply the complete tool a simple modification often will cost less than the abrasive wheel alone that would be used up in modifying a standard tool. Even the more complicated modifications can be produced by us more cheaply, for a revision that requires hours of grinding in your shop, takes only minutes in ours. When you need modified standards call on our nearest Field Engineer. Or . . . send us drawing, sketch or blue print with angles and sizes shown. Specify grade of Kennametal or describe work. For complete instructions see our new Tool Manual. Write for a copy of it today.



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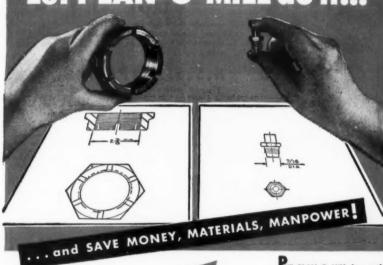
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8% and 12% COBALT HIGH SPEED STEEL You can now use COBALT HIGH SPEED STEEL on any job.

Be ture and compare our prices an 8% and 12% Cabalt H.S.S. tipped took, with the prices of the solid 18-41, 8% Cabalt and 12% Cabalt H.S.S. shown in right-hand column, bearing in mind the superior performance of our tools.



This full Width Style (shown at left) one has ground for baring, turring or facing. It can also be ground into any bind of flat form tool. If tool is not her madify and off

	INAM. STREET.	1	BHANK BIEE		H, B. S. TOP SIZE			PRICE SACH CUSHIONED BY COBALT HIGH SPEED STEEL IN LOTE OF			
_		A		0		w	L	14	5-19	25-48	80+
	sc-rw	16	14	4	Nie	14	11/2	\$1.49	\$1,10	10.87	89.71
=	IO-FW	96	16	415	16	4	114	1.82	1.34	1.27	9.10
3	SE-FW	-	-		16	34	11/2	2.28	1.04	1.84	1.4
*	mr.Fw			7	160	1	2	3.70	3.11	2.78	2.90
1	83-FW	194	11/4	7	16	1%	5	5.30	4.81	4.11	3.71
\$	DK-FW	11/6	15%	10	1/ie	11/2	8	19.80	8.88	7,98	7.4
	BL-FW	8	2	12	14	2 .	31/2	19.80	16,90	19.39	14.16
	880-FW	1/2	1	7	1/10	1/2	2	2.60	2.18	1.80	1.00
3	an-FW	%	114		16	16	2	3.40	2,86	2.42	2.20
#	BP-FW	46	114		7/10	34	215	9.60	4.78	4.00	3.70
3	88-FW	8	116	7	16	1	2	4.65	3.88	3.40	8.11
8	ST-FW	1	116	10	1/1a	1	3	8.05	8.71	5.60	5.4
CT.	sv-Fw	1	2	12	1/2	1	255	11.10	9.25	8:35	7 30
2	ew-Fw	11/4	2	16	16	114	4	18.80	14.48	12.80	12.80

HAME TOWARD,	HI	CUSHI 17% CI GH SPE	TARBO	183.	American PRICE EACH of Handward and Chronid SOLID H. S. S. 700L5 of mine also as therefore tools from any the second of the or mine and are for comparison purposes only			
	1-4	6-10	25-48	80+	18-4-1	9% Cubalt	12%, Cobalt	
190-FW	81.67	81.33	\$1.00	\$0.95	30.46	30.00	\$1.00	
110-FW	2.32	1.90	1.60	1.43	.79	1.18	1.78	
12E-FW	2.72	2.24	1.00	1.78	1.38	1.00	2.00	
1314-FW	4.97	3.82	3.48	3.25	3.14	4.00	7.00	
123-FW	8.65	8.72	8.12	4.88	4.80	7.25	11.00	
ISK-FW	13.30	11,86	10.40	9.80	10.00	14.90	22.60	
12L-FW	24.90	21,90	19.80	18,90	21.60	31.00	48.20	
1286-FW	3.19	2.62	2.34	1.06	1.67	2.30	3.90	
12%-FW	4.12	3.47	3.04	2.80	2.00	4.10	- 0.25	
12P-FW	7.00	1.00	8.18	4.60	4.88	8.70	10.00	
125-FW	8.88	4.83	4,30	. 4.00	3.90	8.75	8.75	
12T-FW	9.90	8.45	7.60	7.00	6.79	9.90	19.00	
12V-FW	13.88	11.60	19.50	9.80	10.80	15.80	24.18	
12W-FW	21.00	18.30	18.00	15.90	19.90	27.79	62.50	

These tipped tools will be supplied with H.S.S. tips-64 to 66 Rockwell "C" hard.

FREE TRIAL TOOL

On receipt of your company purchase order stating size of tool wanted and marked "Trial Tool—NO CHARGE" we will ship you one of the following sizes of our cushioned 8% Cobolt H.S.S. Tipped Tools: $\frac{1}{2}$ " sq., $\frac{3}{4}$ " sq., or 1" sq.

One FREE TRIAL TOOL to any manufacturer operating a machine shop.

GENERAL TOOL & DIE COMPANY

555 Prospect Street

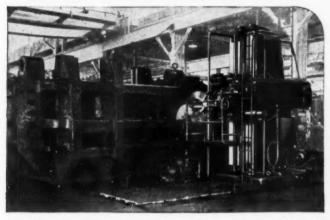
Phone Orange 5-2500

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MID-EASTERN SEABOARD DISTRIBUTOR, Tool Engineering Service Co. 401 No. Broad St., Philadelphia, Pa., Phone Lombard 8623



Orders for this machine are being shipped promptly.



Ohio Horizontal extra heavy duty Boring, Drilling and Milling Machine (floor type) bores steel bed frame of 8" Ajax Forging Machine for crankshaft bearing sleeves. Work done fast, accurately, profitably.—Photograph by courtesy of The Ajax Manufacturing Company, Cleveland, Ohio.

When America's first all-anti-friction boring, drilling and milling machine appeared 13 years ago, it bore the name of Ohio. Ever since, we have endeavored steadily to add new features worthy of this precedent. Example: a portable control feature which enables the operator to get more work done in less time with less effort. Other features: nitrided spindle, narrow guides, internal gear-tooth type clutches, unit construction, anti-friction

bearings, built-in rapid traverse to spindle and all other parts, continuous spindle feed of 72° with full-length spindle support, push-button control Floor and table types in both heavy duty and extra heavy duty models. Ask for a copy of our well illustrated Bulletin 300.

Orders for Ohio Horizontals are now being shipped with reasonable promptness. Better indicate your requirements at once.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO



PRECISION CENTERED EYE BENDING

A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

with

DI-ACRO BENDERS

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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showing many kinds of "DIE-LESS DUPLICATING" produced with DIACRO Benders, Brakes and Shears.



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Forming radius 2" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action. right or left hand mounting and reversible forming nose.



BENDER No. 2

Forming Radius 6" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius, Di-ACRO Benders form bus bar and other strip stock both flat and edge-



BENDER No. 3

Forming radius 9" app.
Capacity ½"
round cold
rolled steel
bar, formed
cold to 1" rad
di us. Bender
No. 3 is especially designed for circraft,
marine and
other large radius bending.





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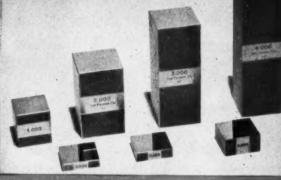


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well C) (aps only 1/3 as fast as ordinary gage block steel. A useful life of at least 6 times that of ordinary gage blocks is realized. Even distribution of wearing surfaces assures flatness, parallelism, accurate calibra-

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* On the Isle of Man great stone rings several feet in diameter have been used as wedding rings. As part of the legal wedding ceremony the bride and groom shook hands through the large hole in the middle.



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1/8	3/8	3/8	3	2.20
5/32	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1 3/4	4 1/4	2.80
1/2	1/2	i	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1 3/4	1 3/4	1 3/4	6 1/4	5.40

SINGLE END Two and Four Flutes

Dia. of Mill	Dia. of Shank	Length of Flutes			verall Longth	Net Price
1/8	3/8		3/8	2	5/16	1.40
3/16	3/8		1/2	2	3/8	1.40
1/4	3/8		5/8	2	1/2	1.40
5/16	3/8		3/4	2	1/2	1.40
3/8	3/8		3/4	2	1/2	1.40
7/16	1/2	1		2	1/16	1.76
1/2	1/2	1	1/4	3	1/4	1.88
5/8	5/8	1	5/8	3	3/4	2.40
3/4	3/4	1	5/8	3	3/4	2.52

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Four Fluted

Dia. of Shank					Net Price
3/8	1	1/4	3	1/8	1.68
3/8	1	3/8	3	1/8	1.68
3/8	1	1/2	3	1/4	1.68
1/2	1	3/4	3	3/4	2.08
1/2	2		4		2.16
5/8	2	1/2	4	5/8	2.76
3/4	3		5	1/2	3.44
	Shank 3/8 3/8 3/8 1/2 1/2 5/8	Shank o 3/8 1 3/8 1 3/8 1 1/2 1 1/2 2 5/8 2	Shonk of Flutes 3/8 1 1/4 3/8 1 3/8 3/8 1 1/2 1/2 1 3/4 1/2 2 5/8 2 1/2	Shonk of Flutes 3/8 1 1/4 3 3/8 1 3/8 3 3/8 1 1/2 3 1/2 1 3/4 3 1/2 2 4 5/8 2 1/2 4	Shank of Flutes Length 3/8 1 1/4 3 1/8 3/8 1 3/8 3 1/8 3/8 1 1/2 3 1/4 1/2 1 3/4 3 3/4 1/2 2 4 5/8 2 1/2 4 5/8

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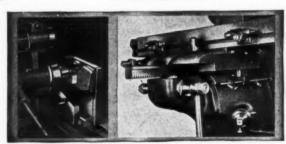
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work-piece under full
view.

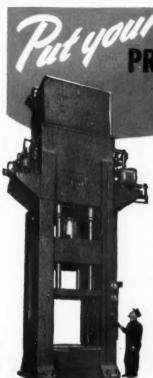
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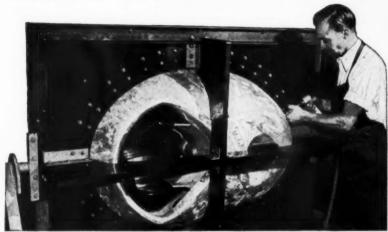
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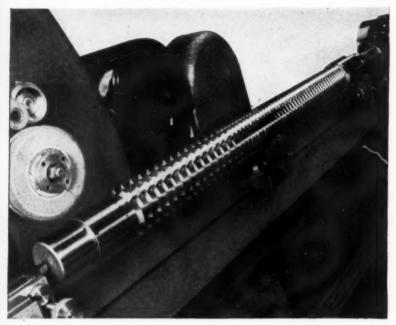
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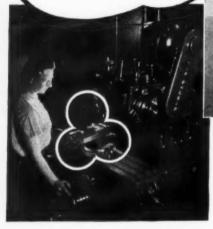
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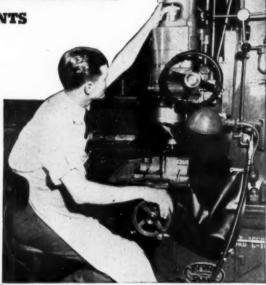
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ALL KINDS OF CARRIDE TOOLS . DIAMOND TOOLS . DIAMOND POWDER





Please send me folder covering the New England line of tungsten carbide, boron carbide and diamond contact points and anvils.

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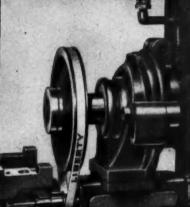
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Grinding Those Difficult Jobs with





Hachments

ABOVE

No. 90-31 Vertical, sharpening broach with 5° clearance.

AT RIGHT

No. 90-30 Horizontal, grinding a difficult keyway in a hard-to-get-at place.

Surface Grinders Do Double Duty

Liberty High Speed Grinding Attachments for surface grinders are precision tooled for greater accuracy on intricate and hard-to-get-at precision grinding iobs.

Write for Detailed Information

LIBERTY TOOL & GAGE WORKS INC. 231 Georgia Ave. Providence 5, R. I.



Tomorrow's Tools for Today's Tasks

Today's production program demands accurate, efficient cutting tools within easy reach. Cairing standard kits (particularly recommended for tool rooms, machine, die and repair shops) provide the answer for all counterboring, countersinking and spot-facing operations.

There are seven sets from which to choose. Set B-4 is illustrated here. Each contains tools designed with special features to meet different requirements—each is a logical assortment of interchangeable counterbores, pilots and holders neatly boxed in sturdy wooden cases with stout hinged covers.

FIRST AID FOR THE TOOL ROOM

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.



The interchangeable holders in these sets are of Morse Taper or straight shank type. (Optional.) Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. The use of these interchangeable assemblies assures large savings over the old fashioned solid (integral pilot type.

All counterbores, pilots and holders selected are standard items of the most active 'sizes used. Replacements may be quickly obtained from stock.

Gairing Interchangeable Counterbore Set No. B-4

THE GAIRING TOOL COMPANY, Detroit, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools



WHAT DO YOU NEED IN SPECIAL CUTTING TOOLS?



ACCURACY?

Every order is carefully work-planned to your blueprints—and each operation painstakingly machined—even to 1/10,000 of an inch.

EXTRA CUTTING LIFE?

Cutting teeth or flutes scientifically designed for longest cutting life—plus correct scientific heat treating—give added useful life.

FAST DELIVERY?

Long experience, special facilities and "Know How" permit semi-production speed — even on specials.

ACE:

S P E C I A L CUTTING TOOLS

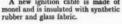
Send for bulletin

American Cutter & Engineering Corp.

31741 Mound Road

Warren, Mich.

Fins applied to the sides of aircraft tires have been found to reduce wear. When the landing gear is lowered, the air pressure spins the wheels and reduces the scuffing of the tires in their first contact with the ground.



A new ignition cable is made of

Pure tungsten can now be pro

duced directly from the ore by a newly reported electrolytic process.

A patent assigned to a large truck of a regular truck to a half-track

manufacturer permits the conversion crawler.

The Office of War Information has an exhibit of new materials, methods, and products in the Social Security Building in Washington.

Echo sounders, intended to measure the depth of water under a ship, are being used to locate schools of fish.

Experiments are being made with alloys of wrought iron and nickel.

Machinery has been designed for the high-speed, mass-production baking of bread with infra-red lamps.

Neon lights will be standardized in 98.colors.

Several manufacturers of air-conditioning equipment are working on plans for a \$1,000 unit suitable for a six-room house.

At least 30 aircraft parts of laminated plastic paper are in production.

Lamp bulbs are being made shatterproof by a coating of lacquer.

A new double-barrelled spray gun that can handle two fluids at once has just been patented.

A novel mail box answers audibly any spoken request for the zone number of any address in the city.



The formerly worthless scrub palmetto, which grows like a weed on the Gulf Coast of Florida, is now ready to supply material for wall-board, brushes, binder twine, upholstery, insulation, and for use as a reinforcement for plastics and Portland cement.



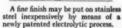
A plastic molding powder is being made from potato starch.



Some engineers foresee the time when the refuse of cities-garbage, ashes, paper, etc.-will be removed continuously by underground tubes and burned in large incinerators to furnish power.



Shells are being tested by a new variation of the old trick of dropping a coin on the counter. When dropped on metal plates, the perfect shells make a particular sound that is detected and reported by an electronic "ear".





The strength of spot-welded aircraft joints is being successfully tested by X-ray.



Because of its peculiar stretch and slow recovery, as well as its light weight and resistance to rot, Nylon rope is expected to have many postwar uses where a shock absorbing effect is required.

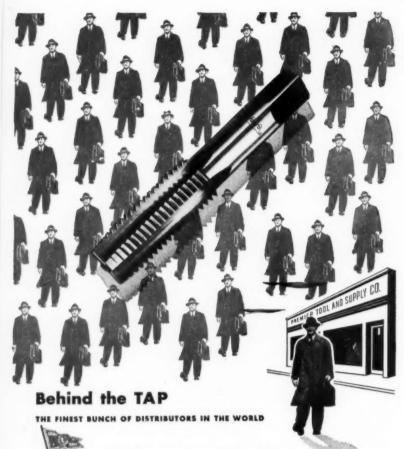


A new flexible tubing is made of woven glass fiber covered with plastic.



A new street cleaner sucks up leaves and compresses them for fertilizer.





Yes, you get more than a fine tap when you specify "Greenfield"— and one of the most important plus values you receive is the "on the spot" service of Greenfield Distributor carries a complete stock. He can be at your side in a few minutes. In nearly every industrial center in America you will find

that the leading small tool supplier is a incuber of the nation-wide "Greenfield" distributing organization, devoted to helping you solve your production problems.



GREENFIELD

GREENFIELD TAP AND DIE CORPORATION
OREENFIELD, MASSACHUSETTS



PRECISION GAGES . GROUND ENTRAD TAPS . FREM EGGES . PRECISION MACHINED PARTS . HEAD TREATING .

It's a whale of a job to turn one of these big ship propellers. Here again Macwhyte ATLAS Braided Wire Rope Slings came to the rescue. Now it's comparatively simple. Do you want to improve your rigging methods? Consult Macwhyte.



A safe sling gives workmen confidence...speeds up work, production...helps plant morale.

Macwhyte Slings are safe slings. Before you decide on the design of your sling gear, before you decide on how you will wrap up your load for attachment to cranes...ask Macwhyte for helpful suggestions.

You'll get practical cooperation and

suggestions based on experience with hundreds of others doing jobs like yours.

Macwhyte Slings are in great demand but our pledge to you is: "We will continually produce to the utmost of our ability without sacrifice of quality. We will study your handling needs with you and help you plan the design on which the best delivery can be made."



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2966 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of the correct wire rope for your equipment

Left-& Right Lay Braided Slings - Aircraft Tie-Rods - Aircraft Cable ."Safe-Lock" Swaged Terminals

Mill Depots: New York - Pittsburgh - Chicago - Ft. Worth - Portland - Seattle
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NO. 7424-5

MACWHYTE SLINGS FOR INDUSTRY Lifting safety to new heights"

When larger cranes are built, Macwhyte ATLAS Braided Wire Rope Slings will be made to meet their capacity

* Let's ALL back the attack - buy ANOTHER War Bond! *

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I IMA'S

Gearshift Drives 1 to 25 hp Electric Motors ½ to 75 hp Pedestal Grinders 2 and 3 hp Magnetic Polishing Lathes ... Bench or Pedestal Types



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THE LIMA ELECTRIC MOTOR CO.

282 Findlay Road

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS





Check the Features against conventional type cutters:

 Leaves a finish comparable to that secured by grinding.

 Takes a large cut with ease...its production limit is determined only by the horsepower of the milling machine.

 Removes metal from two to ten times faster than conventional cutters.

· Does not dig in or chatter.

 Takes a curl chip like a lathe tool. The chips slide back of the cutting edge, tending to sharpen the tool as it is used.

Circular cutting bit slices metal with a true, knife-like, Shearcut action.

 Lasts from 10 to 30 times longer between regrindings than ordinary milling cutters.

 May be resharpened in less time than it takes to remove a usual milling cutter head from the machine.

Eliminates necessity of grinding, filling or polishing as no tool marks need be left on work.

SEND YOUR ORDER WITH PRIORITY RATING TODAY!

Stock sizes: 3" to 18" inclusive. Special Cutters 20" to 60" made to order.

Immediate deliveries on stock sizes.



362 S. MAPLE DRIVE, BEVERLY HILLS, CALIFORNIA

At left the conventional type of culting down or knife.

At left the conventional down or knife.

At left the conventional down of knife.

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GONE FOREVER-battered and damaged die sets caused by prying

PULLERS do the job the FIRST for sale sure separation. They are feature against the property of the property o time. No Delay, Use **ACRO PULLERS** for sale sure separation. They are fast-accurate-positive. War plants using these pullers report savings as high as 50% in time alone. damaged die sets caused by bysig or hammering. ACRO DIE SET PULLERS do the job the First

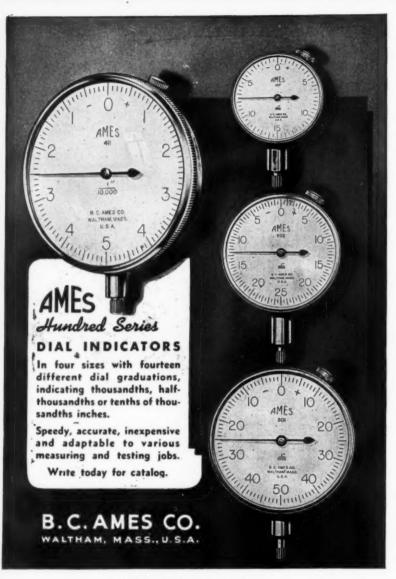
ACRO PULLERS are indispensable for the grinding, mounting and ACRO FULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily.

litting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height. Order a set today. Convince yourself of the savings you can write in your tool room. ACRO PULLERS furnished in three sizes.

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Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

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UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5½ "a cross flat, 2-7/16" thick. Accommodates a ½" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.

Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature and prices.



\$55.00

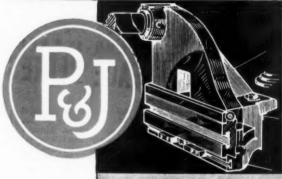


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\$60.60

STANDARD SLIDE TOOL



This versatile tool is intended for the performance of a great variety of special operations on the larger size Potter & Johnston Automatic Turret Lathes.

WITH OVERHEAD PILOT

There is room for attaching a number of cutter blocks to the 18" T-slot slide. The proportions of the Tool Body together with the Pilot Bar reinforcement, combine to produce a resistance to vibration which insures accurate work. The cross motion or feed of the Slide is produced by a pusher on the Cross Slide of the Machine. For internal recessing cuts, taper boring or turning cuts the Tool Slide is actuated by suitable cams attached to the Machine Cross Slide, the Cross Slide Base, or to the Machine Bed.

78 pages of standard tools and tool fixtures, with

dimensions and specifications are included in this helpful new catalog. Many of these new tools will help you reduce costs and speed production. May we send you copy today—no obligation.



POTTER & JOHNSTON MACHINE COMPANY
Automatic Machine Tools PAWTUCKET, RHODE ISLAND

For Assured ! Accuracy!

MEEHANITE METAL SURFACE PLATES



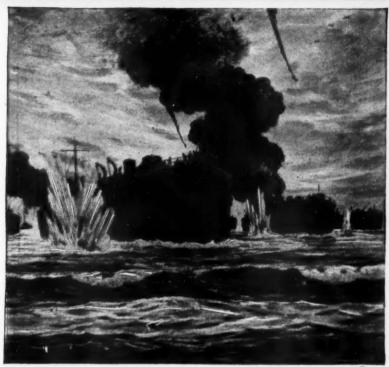
Fine close grain, uniform texture, unusual strength and solidity are the superior features of Meehanite Metal Surface Plates. Surfaces are hand-scraped to extremely close tolerances. Meehanite Metal Surface Plates are one-third heavier than any other quality plates. This extra solidity, which is scientifically distributed by the honeycomb base, is your assurance of precision accuracy.

3½ x 4 6 x 6 8 x 8 9 x 12 10 x 10 12 x 12	5 11 22	21/2"				Ground 9.50
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8 x 8 8 x 12 9 x 12 10 x 10	22				19.00	15.00
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9 x 12 10 x 10					35.00	28.00
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10 - 10	43	31/2"	0001"		35.00	29.00
14 X 1/2		31/4"		*******	43.00	37.00
12 x 14					59.50	40.50
12 x 18	85		0001 M		68.00	55.00
*12 x 24		41/4"	0001"		95.00	80.00
	. 100				75.50	62.50
16 x 16	100				75.00	62.50
18 x 18	140	414#	0001"		73.00	
18 × 20	. 160	4149	0001#	******	98.00	80.00
	200			******	111.50	90.00
	310	61/4	00000"		133.00	108.00
	. 160	414"			174.00	137.50
	. 325				123.50	96.00
	224	614	00025".		190.50	150.00
		0/2	00025".		180.00	142.50
	. 510		00025".		275.00	220.00
			00025".		345.00	265.00
	1425	10	00025".		596.50	470.00
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48 x 96	.6000	12"	0005" .	1		1050.00
Ribbed Pattern						†Planed

Other sizes to specification. Angle plates and straight edges of Mechanite Metal also available. Good deliveries on most sizes. Write for folder.

ACME TOOL COMPANY

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AVAILABLE ON REQUEST...Handsome full-color 10" x 10" reproduction of this dramatic painting of the "Green Dragons" by Lt. Commander Anton Otto Fischer, the internationally famous marine painter. No advertising.

When the Green Dragons Strike

Fearfully and wonderfully made are the LST's-Landing Ships, Tanks—the "Green Dragons" of the Allied Invasion Forces. When their prows touch enemy beaches giant laws open and spew forth a small mechanized army—tanks, mobile artillery, fighting men. Another beach head is established, to have and to hold! Aboard ship, unfailing ventilating systems are required to remove poisonous exhaust gases of warming up motors in the tank deck. Accordingly every LST is equipped with high speed blowers, driven by Star Electric Motors so powerful that two alone will ventilate the hull, giving a wide margin of safety. Also, aboard each LST there's a Star gear motor to operate the elevator—to lift or lower tanks and trucks. At sea or in industry—"in the tight spots, it's a STAR." STAR ELECTRIC MOTOR COMPANY, Bloomfield, N. J.



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DUST COLLECTOR

A Combination of an Air Filter Unit and a Dust Collector Unit in One.

Designed for the removal of fine dust from the air, arising from the operation of grinding, buffing and polishing wheels, sand belts, scratch or abrasive cutting wheels, or any other dust producing machines.

Our Special Moveable Unit (attached to base with caster rollers and flexible moveable hood) is especially adapted for use in plants operating several dust producing machines on part time basis.



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- The Dustex meets all requirements of the Health and Safety laws as well as State Factory Inspection regulations.
- It conserves heat by permitting the filtered air to remain indoors.
- It is portable, light and inexpensive.

The Dustex will greatly decrease the inefficiency of employees caused by dust alleraies.

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Model 2 Moto-Tool, complete with accessories, as illustrated, in felt-lined hardwood case— \$23.50. Model 2 Moto-Tool only, with emery wheel point — \$16.50.

21,000 B.P.M.

Used in machine shops and tool rooms for finishing intricate dies. Used an production lines to clean castings, turnings and forgings. . . sharpen tools and do hundreds of grinding, finishing, polishing, heaving, runting and etahing operations.

Dremei Mote-Tool has AC-DC moter with checkproof bakelite housing; cil-scaled (cil-lass) hearings, and built-in cooling fan. Weighs cally 13 cunces — so light and compact a girl cas handle it with cate. Dynamically calcanced armainre climinates vibratien and provides precision control. Mote-Tool's high speed (27,000 rpm) permits finer, faster work—conserves cetters.

Dremal Mote-Tools are proving indispensable adds in speeding up war production in such plants on Canoral Electric, Westinghouse, Remington Arms, Ford, Nuch-Kelvinster, Cansolidated Aircraft, Dengles and Northrup Aircraft, and many other "Arsenals."

Try a Dressel Mete-Teel on your own inho-in you own shap. See how versatile, how indispensable 5 to --how it saves time and materials. Order free your distributer or contact a Dressel Representative PROMPT SHIPMENT on orders with proper priority.

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Whether you have a Mete-Tool or only other type of grinder, no only games Drawel shap-rected Acassanta's—stell cutture, emery wheel gaints, brushes, sanders.

799APPAPPITITION

DREMEL MFG. CO. DOPERMEN RACINE, WIS.U.S.A.

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Immediately Available

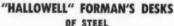
WORK-BENCHES

You can save yourself bother, work and expense when you need workbenches by selecting just what you want from our "Hallowell" Shop Equipment Catalog. It contains among a great many items, 1367 combinations of "Hallowell" Work-Benches of Steel from which to pick your choice and you'll know beforehand what the cost will be.

"Hallowell" Work-Benches of Steel are of sturdy construction, made to stand

firm and rigid without the need of costly, time consuming bolting to the floor. There's not a wobble or a shake in any of them.

Where a long, continuous bench top is needed, just join as many "Hallowell" Benches together, end-to-end, as are required for the desired length. It's also just as easy to convert them back to individual units or move them to other parts of the shop.



Here's a Foreman's Desk of steel of just the right height for doing desk-work while standing. It can be supplied with pigeon holes or compartments at the top and a roomy drawer for keeping records and blue prints under lock and key. The shell as shown is handy for the likely assortment

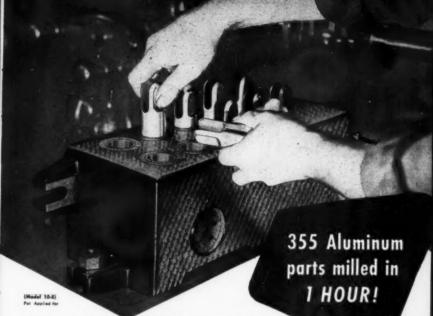


It will pay to be fully informed on the entire line of "HALLOWELL" shop equipment of Steel. We'll gladly send catalogs on request.

STANDARD PRESSED STEEL CO.

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HALL WELL



Milling of 10 parts simultaneously increases production 100-500%



Before After

These eluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per heer (floor to floor) as compared with single milling operations of only 71 per hour.



CHROME STEEL PARTS
These parts, high heat treated of Chromoly, were produced at the rate of 62 hear.

maly, were produced at the rate of 62 per hour (floor to floor) on the Aerza Multi-Grip Chuck. Individual milling time was 15 per flour

AERCO HYDRAULIC MULTI-GRIP CHUCK

check the operational features back of this record:

- A single leading for 10 parts: new multi-grip chuck saves starting, stopping, cleaning fixture each time as with single-station units.
- Me secrifice of accuracy: self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations.
- Pressure built quickly: hydraulic hand pump lever builds pressure up to 2500 p.s.i with a few strakes.
- Guick re-leading: self-opening callets are quickly re-leaded; adjustable depth stop for each collet eliminates necessity for gauges.
- Safe operation: work is held rigidly in callets and cannot turn or be pulled out during milling operation. Safety stop provents damage to callets should all stations not be filled
 No weste milling mattern: Parts are held to minimum center distance eliminat-
- ing cutting oir -- plus advantage of two rows which again doubles increased production

 7. Waristant of called connector 23.0.8 shock has award called connects from 36."
- 7. Variety of cellet capacity: #10.8 chuck has round collet capacity from 1/4" to 1/2" inclusive #10.6 chuck has round collet capacity from 1/2" to 11/4" inclusive. Square and haxagon cellets evailable for both chucks.

Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

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DANLY NATIONAL ASSEMBLY

TLOS ANGELES

To Precision Standards

Precision finish of every part in Danly standard die sets makes possible Danly National Assembly. The resultant perfect fit saves you time and money through faster setups and longer, trouble-free operation.

Every Danly Die Set is individually assembled to your specification, through the Danly Plan of National Assembly to Precision Standards.

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WHY BE SATISFIED WITH LESS THAN STURTEVANT QUALITY?

In any operation requiring the accurate control of torque on vital nuts, screws, bolts, hydraulic fittings — of all threaded parts — have the advantages of Sturtevant permanently accurate Torque Wrenches.

- 1. Clear faced dials—readable from any angle.
- 2. Permanent accuracy-Longer Life
- 3. No friction, adjustments moving parts or fragile mechanisms.
- 4. Practically indestructible.
- 5. Sturtevent pioneered design and quality throughout.

Because Sturtevant Torque Wrenches are PERMANENTLY accurate, the vast majority of torque wrench users standardize on "STURTEVANT".

Over 50 models and types from 0-40 inch ounces to 7200 inch pounds.

PA STURTEVANT CO



HOW WOULD YOU LIKE TO CUT MILLING COSTS



Cal-Cutters over high-speed steel tools that output from

be jumped 5 times—or more! This is possible because feeds and cutting speeds with Cal-Cutters are phenomenally increased, removing metal faster than has ever been possible with common tool steels—and with greatly improved surface finishes. Furthermore, Cal-Cutters stay on the machine longer between grinds, lower down time and tool maintenance. If you can use extra machine capacity, investigate Cal-Cutter possibilities.

Catalog 381-2 sent free upon request.

CLASS 1700 HEAVY-DUTY FACE MILL illustrated above.

End mills, side mills, saws, face mills, special tools, etc., are also available.



You can mill it faster, and mill it better with Carbide-tipped CAL-CUTTERS









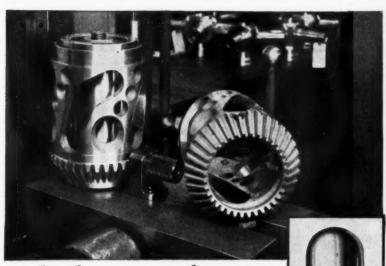






MACHINERY MANUFACTURING COMPANY

HORIZONTAL MILLS, VERTICAL MILLS and Vernon Line of



A Typical Problem

SOLVED BY BROACHING

Many years ago broaching took over the problem of mass production and solved it. Today a much more difficult problem is also finding a solution by broaching. It is the problem of maintaining excessively close tolerances and still using mass production methods.

This is a typical problem—to make a cut on the Cam lug stop for the Hydromatic propeller to a plus or minus .001 and still keep up mass production. With the help of Hamilton Standard engineers, an entirely new idea was evolved whereby guide fingers locked the fixture and broach body in constant alignment in spite of slight slide torque, broach wear or uneven cutting pressure. Tolerances well within limits have been consistently maintained.



One of the greatest aids to modern axiation is the Variable Pitch Hydromatic Propeller whose barrel and cam set-up is shown above.



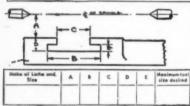
Turret Lathe Operations



on Engine and Bench Lathes with ENCO Turret Tool Posts

Turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post to speed production on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at once saving valuable lost-time on second operation set-ups. Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.

'A" Dimension range (from diagram on this page)	Model 6-S 2"3-1/8"		Model 3½-S 1-1/8"-1-3/4"		Model H 7/8"—1-5/16"
Lathe Swing	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Banch Lathe
	1" or 1-1/4"	3/4" or 5/8"	1/2" Sq.	3/8" Sq.	3/8" Sq.
Maximum tool bit size	1-3/8" toolhoider for 3/8" bit (Where no tool bit size is specified, tur- ret will be furnished for 1 inch tool bit)	(Where no tool bit size is specified, tur- ret will be furnished for 5-8 inch tool bit)			
SPECIFICATIONS	6" square Packed in carton Shipping Weight 35 pounds	4 tool 12 position 4" square Packed in carton Shipping Weight 12 pounds Price . \$49.50	8 pounds	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds Price . \$23.00	3" Hex Packed in cartor Shipping Weight 4 pounds



One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired.

- 12 position indexing
- 3 positions for each tool
- Carburized hardened steel construction
- Mounts rigidly in compound T-slot
- Keeps setting accurately
- Indexing is self-contained. Eliminates all chip interference

IMMEDIATE DELIVERY

on Turrets for these lathes: Atlas • South Bend • Logan Sheldon • Clausing

Also all models with semi-soft base on center post for quick adaption to your lathe.

Better dealers everywhere carry complete stocks of Enco Turret Tool Posts and Enco Tailstock Turrets. However, if your dealer does not carry them, send your order and specifications direct to the Chicago or New York offices listed below.

ENCO MANUFACTURING COMPANY, Dept. 9

General Office and Factory: 3321-23 MONTROSE AVE., CHICAGO 18, ILL. Eastern Sales Office: (Complete stocks carried)
118 E. 28th ST., NEW YORK 16, N. Y.

ENCO Heavy Duty



SPECIFICATIONS	HD-1	HD-2
Size of turret block	4-1/2" Sq. 3" thick	6-1/2" Sq. 4-1/4" thick
Range of tool slot height	I" or I-I/4"	I-I/4" to I-3/4"
Tool Size Range	3/4"-1"	1"-1-1/2"
"A" Dimension Range	2"-3-1/4"	3"-4-1/2"
Maximum "C" Dimension	2-3/4"	4"
Price	\$99.00	\$130.00
Shipping Weight	20 lbs.	60 lbs.

Capable of taking the strain of hogging cuts under high speed. Designed to mount maximum tool bits. Tool overhang is cut to minimum in these heavy duty models by the tools being

mounted directly over the base of the turret. This increases the tool rigidity, permitting a heavier cut which reduces lathe time. 12-position tool indexing adds versatility to the rugged design of this accurate, cost-saving tool.

Models HD-1 and HD-2 can be shipped from stock with semi-soft base which can quickly be adapted to your lathe. Two weeks required for turrets fitted from specifications. When ordering turrets to specifications please furnish all dimensions shown on the lathe specification chart. Be sure to specify maximum tool to be used.



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Model A

21/2" in diameter with 6 bored " tool holes. Fitted with No. 1 Morse Taper arbor or fitted with No. 2 Morse Taper arbor (No. 2 Morse Taper arbor furnished unless otherwise specified.) Packed in carton. Shipping weight 3 lbs.

PRICE \$18.95

Model B

5" in diameter with 6 bored tool holes. Fitted with No. 2 arbor furnished with 7/8" or 1" tool Fitted with No. 3 arbor furnished with 1/8" or 1" tool

holes. Fitted with No. 4 arbor furnished with 1" tool holes. 78" tool holes are standard on Model B with No. 2 or No. 3 arbor unless otherwise specified.
Packed in carton. Shipping weight 12 lbs.

PRICE \$32.95

ENCO Tailstock Turrets are carefully manufactured with all parts fitted within close tolerances. Each turret must pass several thorough inspections with the final inspection for concentricity of tool holes. Because the tool holes are bored after the turrets are assembled, ENCO Turrets are naturally very accurate. Their dependability is indicated by a substantial volume of repeat orders from ability is indicated by a substantial volume of repeat orders non-users. Many shops begin with one ENCO Tailstock Turret to set up tools for a particular job. As other jobs come up, additional turrets are purchased and set up in the same way. ENCO Turrets are as easily set up in your lathe as a center.

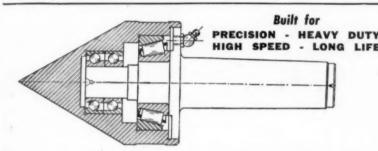
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FEATURED in this Issue

SPECIAL GRINDER APPLICATIONS are considered, pro and con, by John E. Hyler in the story commencing on page

WESTINGHOUSE FORUM again broke attendance records this year. See report of the meetings in the story on page...237

SURFACE DAMAGE—its cause and control was one of many arresting topics presented by E. L. Hemingway at the Westinghouse Forum. See page......245

"LET'S TALK SHOP" brings an interesting range of items this month including a discussion on machining steels on automatics with carbide tools. See page...269

WHAT'S NEW includes several startling new items this month such as the Monarch Shape Turning Lathe and the new Blank & Buxton Micro-Turnthreading Tool (Page 352), This section starts on page 298

MECHANICS THRU THE AGES 428

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as The Editor Sees It

UTTING costs is the basic function of machine tools, James Y. Scott, President of the NMTBA told members at the recent Cleveland Spring Meeting.

"Do we have to wait until the war is over," Scott said, "before we can talk to a manufacturer about the fact that a new machine tool might help him cut

his costs?"

"Is it heresy to suggest that new machine tools might even help cut the costs of war production and

thereby lessen the expense to the taxpayers?

"After this war, cost-cutting is going to be just about the biggest problem in the entire industrial field. You know wages aren't going down. And you know too that if prices keep on going up, American industry won't be able to get the mass markets needed to sustain high level postwar employment.

"It is up to us right now to do so good a job of machine tool re-designing that when the war is over, American manufacturers can continue to pay high wages, and at the same time put their products on the market at prices that the masses of people in this country and in other countries can afford to pay.

"That's the only way in which we can keep our system of free enterprise going and prove that industry, operating on the principle of competition can accomplish more things for more people than can Government operating on the principle of regimentation."

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By D. C. MINER*

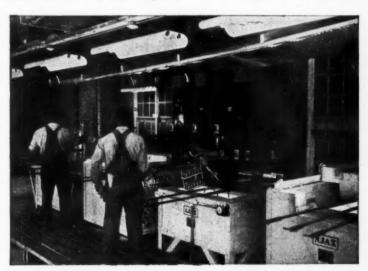
THAT too drastic a quench causes distortion, stress and strain when steels are heat treated, has been common knowledge for many years. Since the war brought shortages of alloys formerly used in volume, the problem of avoiding residual strains and at the same time attaining the required physical properties has been intensified. It was natural that metallurgists would seek a method of hardening which would further "cushion" the shock of quenching.

That method has been the development

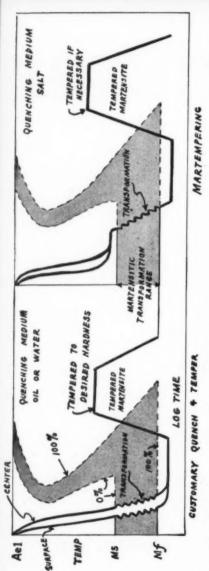
of "interrupted" quenching, in a bath of molten salt.

The heat treater who has used salt for hardening high speed tool steel has been familiar with one form of "interrupted" quenching. The cycle for H. S. steel includes a pre-heat, a high heat at about 2250° F, then a quench in salt at around 1100-1200° F. Altho the quench is at a higher level than conventional hardening practice, because of differences in alloy con-

*E. F. Houghton & Co., Philadelphia.



Heat-treating M-66 fuses in production, using Interrupted Quench bath of molten salt,



tent and carbon percentage, the principle is similar.

It might be well, before discussing causes and cures for undue stresses arising from heat treatment, to review what the job of heat treatment is,

First, we heat, without introducing dangerous thermal stresses, to a temperature which depends upon the critical temperature of the particular steel being used, soaking long enough to homogenize thorous

Then we quench, in a medium that will give a cooling rate which will produce the structure desired—cooling as uniformly as possible. A reheat or temper may follow, to medify the as-quenched structure to one which will give the desired physical properties.

High hardnesses can be obtained only by exceeding the critical cooling rate when quenching. That means a fast quench, rapid enough to miss the "toe" of the "S" curve, but not so severe as to set up residual strains or cause quench cracks.

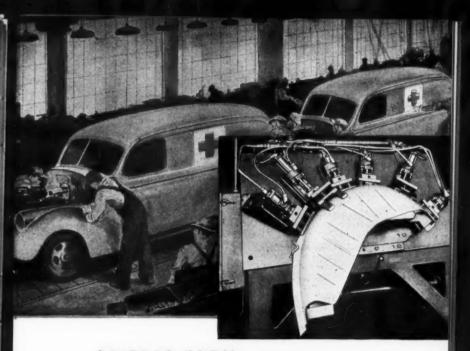
Fast Quenching With Salt

Agitated salt at 400° F, has been found to have a surprisingly rapid quenching speed, almost equal to oil. One of salt's big advantages is the ability to hold at a given temperature long enough for the center of a heavy piece to catch up with the outside, equalizing temperature thru, so that austenite can be transformed to martensite evenly, without undue stress. That is the principle behind "martempering", now an accepted practice.

It should be realized that internal stresses induced by uneven expansion and contraction can cause plastic flow and thus produce permanent distortion. Temperatures thruout the steel being treated should be kept as uniform as possible, if all sections are to expand and contract together.

When steel changes in structure there are bound to be some volume changes, which result in distortion and frequent cracking, unless those volume changes are produced simultaneously. Since steel is ductile when heated to above the critical, warping may result as one portion of the work increases while another remains practically unchanged.

Different rates of cooling are produced by quenching in air, water, brine or oil.



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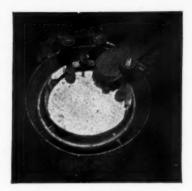
MID WEST HYDRO PIERCE INC.

8201 ST. AUBIN, DETROIT 11, MICHIGAN MADISON 6824 Control of the quenching operation is affected by size of the part, as interior portions cool more slowly than the outside, and sometimes so slowly that the desired rate required for certain steels cannot be obtained.

Liquid quenching media have a wide range of cooling rates. Even using the same type of quenching medium, an appreciable variation of cooling rate can be obtained, depending upon the temperature of the liquid and whether the part is merely immersed, or agitated, sprayquenched or fixture-quenched.

Excessively rapid rates of cooling cause hardening cracks, strain and distortion. As the severity of quench is increased to obtain the required hardness, the distortion will usually be progressively increased.

Hardening cracks readily indicate too severe a quench, but such cracks often are not noticeable even the there may be excessive residual hardening stresses not relieved by tempering, which cause service failures later, even in parts of relatively simple shape. These stresses are the result of:—(1) the in-



Looking down on a Mar-Temp Salt bath, showing immersed heating unit and salt pump for agitation. Pipe around outside of bath inside the shell is perforated to permit jets of water to cool the pot when hot work is introduced.

crease in volume which occurs with formation of martensite, and (2) the difference in rate of contraction which normally occurs as temperature is lowered. The dif-



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The "V" Plan is unified; the Post War Plan is not. Each country, community, association, company and certain individ-uals has its own. With so much effort from so many sources being exerted in the one direction, however, post war planning bids fair to achieve some of its objectives. For example:

The National Association of Manufacturers (14 West 49th St., New York City 20) has developed several guide books on post war planning. One of the objectives discussed in the first booklet is: "Seek to Reduce Costs." In substance it suggests that manufacturing, sales and operating costs should be reviewed to enable a corporation to operate profitably in a competitive economy. Have you given thought to retool-ing for the "peacework" future? New LeBlond lathes do two jobs as one, better and faster . . . they turn a profit as they true your product.







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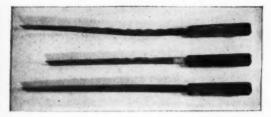
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DISTORTION OF KNIVES—(Top) Quenched in water from 1500° F: (center)—quenched in oil from 1500° F: (bottom) quenched in salt from 1500° —distortion eliminated.

ferences in rate of contraction are due to differences in mass, and become greater as speed of cooling is increased. They are usually more pronounced in complicated sections, as these require an intensified quench in order to obtain uniform hardening. Martensite does not form at one definite point as temperature drops; it forms over a range of temperature. We then have a Ms point to denote the start of martensite formation, and an Mf point at which transformation is finished.

Distortion can be minimized by control of temperature gradients during the heat treating process. As pointed out, this is

more difficult when distance from center to outside of work piece varies, as in a cone-shaped piece such as a tapered tool or milling cutters, hobs, etc. Shape of work, therefore, involving variations in cross section, is a big factor in cause of distortion.

The objective in recent years was to step up speed of oil quenching in order to attain necessary hardness. Oils which wet out faster and possessed rapid heat absorption properties were developed to meet demands of war production on lean alloy steels. Agitation was added to increase quenching speed.





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But when irregular sections were encountered in dies, tools, knives, fuses, A. P. shot and a variety of other parts where a "cushioning" effect was needed to reduce severity of the quench, along came the salt bath in an old-new role.

By quenching from austenizing temperature into a fluid salt bath at around 400° F (slightly above the Ms point) and holding in that bath long enough to equalize temperatures thruout, it was found that martensite would form uniformly with a minimum of strains being set up. Further cooling in air completes the transformation. A draw later will result in Rockwell C hardness from 55 upwards.

That is martempering; its application has been found to improve such properties as ductility, impact strength and fatigue life, while producing high hardness and tensile strength equal to conventional methods of quenching.

Most parts that can be oil-hardened can be martempered in salt. Not all need to be, of course, but when sections are irregular in shape, or present puzzling variations in cross section, so that distortion and cracking become a problem, then it is time for the heat treater to look into the merits of salt for quenching.

Insulating Effect

An important feature of the salt bath that helps reduce distortion is the protection of salt film that forms around cold work when first immersed. This film forms a temporary "insulation" or cushion around the steel, resisting heat shock and aiding in gradual heating.

Scaling or oxidizing of work will not occur in a balanced salt bath. Parts come out clean and free from scale. Modern salt bath furnaces are controllable as to temperature thruout the pot. These furnaces can be mechanized for speedy production line work. They do not need highly trained expert heat treaters, once the heat treating cycle has been perfected.

These advantages are sound reasons for use of salt baths in quenching as well as in other phases of heat treatment,

While martempering is a comparatively recent development, austempering, which preceded it, has been used for some years in treatment of wire, springs and other applications. Austempering differs from

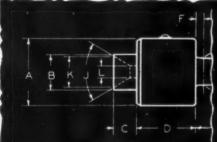
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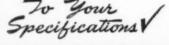


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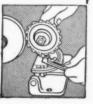
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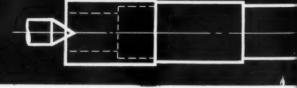
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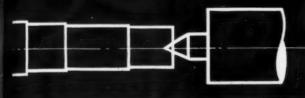
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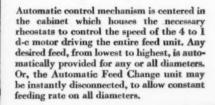
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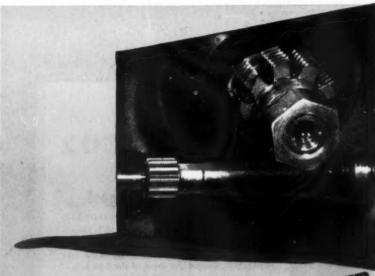
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stops, springs and table clamps. The use of springs under the clamps keeps them in position during the unloading of the station and thus reduces the total loading and unloading time after each cut. (See Fig. 2).

Because of the projection of the work-piece and the extended position of the clamps, it was necessary to locate the arbor support away from the saw for clearance purposes. The arbor, however, is sufficiently supported for this light cut and the forces have been properly controlled by keeping the table close to the column face. Thus, in this operation the three requirements of good milling practice have been observed, viz., correct dimensions and cutting setup and economical performance.

Saw-Cut Spindle Block

An 8" diameter saw \(\frac{1}{2} \)" thick is again used in this operation of saw-cutting a spindle block of cast iron. The cutter speed is set at 34 rpm while workpiece is fed to the cutter at 2" per minute. (See Fig. 4).

FIG. 4-OPERATION DATA

Job Description—
Material—
Machine—
Speed—
Feed—
Freduction Rate—
Fixture—

Cast Iron.
No. 4 Plain.
34 rpm.
3-ipm.
37 hours/100 pieces.
Table setup.
Cutters—

8"x\s/a" saw.

The importance of this second saw-cutting operation is its emphasis upon the changes in speeds and feeds made necessary by a new setup. The saw in this instance is mounted on a stub arbor and is, therefore, not so rigidly supported as in the previous job even the dimensions of the saws in both operations are the same. In this case, it was necessary to increase the speed of the cutter to 34 rpm whereas in the first operation, the saw was operated at 20 rpm. Thus, increasing the surface feet of the saw from 42 to 71.2 fpm, the chip load was correspondingly reduced and the cutting forces acting on the saw and stub arbor materially lessened. Likewise, the feed rate was lowered from 2%" to 2" per minute, and so further reduced the chip load. These changes were necessary to prevent chatter and cutter breakage. (See Fig. 5).

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AIR ENGINEERING EQUIPMENT

Mill Keyway In Gear Sleeve

This job requires the milling of a keyway in a gear sleeve made of SAE-4615 or chrome molybdenum steel. The 3½" diameter high speed keyway cutter is set for climb milling and revolves at 93 rpm while the rate of feed is 7½" per minute. (See Fig. 6).

FIG. 6-OPERATION DATA

Experience shows that a cutting tooth entering a workpiece cuts clean and sharp, whereas leaving the workpiece it breaks and burrs the edge. Since the keyway edges in this gear must be sharp and clean, it is climb-milled.

Climb milling has an additional advantage in this operation. The forces generated by the cutting action tend to pull the workpiece down and toward the observer. Note then how this affects the vise setup. Because the cutting forces are holding the workpiece in rigid position, keeping the shoulder of the gear in close contact with the jaws of the vise, it becomes unnecessary to clamp the vise as tightly as usual, eliminating the possibility of eggshaping the gear sleeve. (See Fig. 7.)

The climb milling is a desirable practice, the operator must determine beforehand whether a machine is equipped with the necessary table screw nut adjustment which permits this type of milling.

FIG. 8-OPERATION DATA

Job Description-Mill one end, cut off other on piston. Material-SAE 4140. No. 3 Plain. Machine-Speed-57 rpm. Feed-% ipm. Production Rate-10 hours/100 pieces. Fixture-Special. One 6"x1/2" hs side. Cutters-

Milling Piston

In order to mill one end and cut off the other on the piston in this operation, two cutters are necessary. One is a 6"x½" high speed side cutter and the other a

One 6" saw.

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6" staggered tooth saw. On this job, the cutters revolve at 57 rpm while the feed is set at %" per minute. This makes possible a production rate of 10 hours per 100 pieces. (See Fig. 8).

Outstanding in this operation is the correct cutting setup. Note that the fixture holding the workpiece-an excellent example of solid and rigid design-is so constructed that it brings the table close to the column face. Secondly, since the distance between the side mill and the saw is predetermined by the specifications, the long arbor between the cutters is properly supported with an intermediate arbor support. By adding this support half-way between the cutters, the stability of the setup has been increased eight times. The rule that applies here and should be remembered may be stated:-The stability increases as the cube of the reduced distance. (See Fig 9).

Clearance On Bracket

In milling the clearance on a take-off bracket called for in this job, a 1½" diameter by 4" long end mill is used. The material in this workpiece is of cast iron, the spindle speed is 165 rpm and the feed is 13½" per minute, which makes possible a production rate of 15 hours per 100 pieces (See Fig. 10).

FIG. 10-OPERATION DATA

Job Description- Mill clearance on takeoff bracket.

Material— Cast iron.
Machine— No. 4 Plain.
Speed— 165 rpm.
Feed— 131/2 ipm.
Production Rate— 15 hours/100 pieces.
Fixture— Table setup.
Cutters— 1½"x4" end mill.

This operation demonstrates the use of the Style C type of arbor for holding a 1" end mill cutter needed to mill the ½" radius at bottom of the bracket as required by the specifications.

The choice of a cutter for this job is the important thing to remember. When radii are to be milled on workpieces clamped directly to the machine table—a cutter twice the size of the radius must be chosen to meet the specifications. Thus, in the case of this job, a 1" cutter had to be selected to mill the ½" radius required. (Fig. 11).



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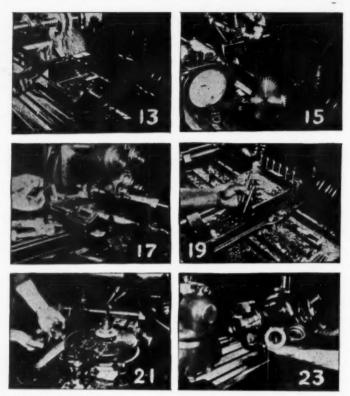
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Straddle Mill Shifter Fork

In this job, a large shifter fork, made of No. 65 Bronze, is straddle milled by two 5" diameter straight side cutters. The workpiece is set up on a vise with special jaws, and the cutters revolve at the rate of 75 rpm while the table is feeding the work at 5" per minute. A production rate of eight hours per 100 pieces is maintained.

The general arrangement of the setup in this straddle milling operation is commendable. The table is close to the column face and the arbor support is set close to the cutters thus insuring a rigid cutter assembly. The cutting forces are directed against both the supported part of the workpiece and the solid jaw of the vise. (See Fig. 13).

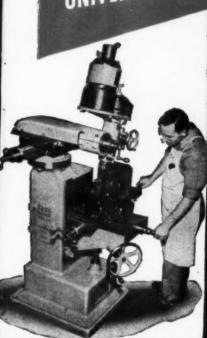
Radius On Cam Gear

The milling of a 3.33" radius on a cam gear of SAE-4615 steel is performed on a No. 3 Plain Horizontal Milling Machine with the aid of a dividing head which holds the workpiece. A %" two-lip end mill revolving at 1000 rpm is mounted in the spindle of the milling machine while the cam gear is fed by hand thru the cut. (See Fig. 14).

This operation shows the versatility of

only one work set-up for <u>all</u> operations with

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Saw Blades

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FIG. 14—OPERATION DATA
Job Description— Mill 3.333 radius on

Material—
Machine—
Speed—
Feed—
Production Rate—
Fixture—
Cutters—

cam gear.
SAE 4615.
No. 3 Plain.
1000 rpm.
By Hand.
26 hours/100 pieces.
Dividing head.
36" Two-lip end mill.

the milling machine. The specifications call for milling a face on the circumference of a circular disc to the radius called for except for the segment containing the gear teeth. This is skillfully accomplished by the setup shown, using a ¾" two-lip end mill turning at 1000 rpm. The workpiece is held in a dividing head, the crank of which is turned by hand to feed workpiece into the cutter. The value in this setup lies in the operator's appreciation of the possibilities of the milling machine in obtaining a correct dimension and cutting setup. (See Fig. 15.)

Mill Precision Stop Lever

This operation involves milling of a precision stop lever, made of SAE-1020 steel. Two 5" diameter straight side cutters are mounted on the arbor of a No. 2 Plain Horizontal Milling Machine. These cutters revolve at a speed of 58 rpm, while the workpiece is being fed into these cutters at a 2" per minute rate. Under such conditions, 100 pieces are produced in 3.6 hours. (See Fig. 16).

FIG. 16—OPERATION DATA

Job Description— Mill precision stop lever.

Job Description—
Material—
Machine—
Speed—
Feed—
Production Rate—
Cutters—

John Mill precision stop lever
SAE 1020.
No. 2 Plain.
S8 rpm.
2 ipm.
36 hours/100 pieces.
Vise.
Two 5" straight side.

A study of this illustration reveals the problem of holding the workpiece properly in the vise and without the use of a specially designed fixture.

The cutters are set and rotated for climb milling so the cutting forces are directed downward against the base of the vise and the tendency to pull the workpiece out of the vise is eliminated. A false-bottom, to support the stop lever solidly while in the cut, has been inserted under the workpiece between the vise jaws. (See Fig. 17).

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Straddle Mill Pin

Two 5" half-side milling cutters are properly mounted on the arbor of a No. 2 Plain Horizontal Milling Machine in order to straddle mill six door latch pins in one setup. The material in this workpiece is cold rolled steel. A speed of 80 rpm and a feed of 3½" per minute are used. A vise equipped with special jaws to hold six pieces aids in obtaining a production rate of 100 pieces each hour. (See Fig. 18).

FIG. 18—OPERATION DATA

Job Description— Straddle mill door latch

Material— Cold rolled steel.

Machine— No. 2 Plain.

Speed— 80 rpm.
Fred— 3½ ipm.

I hour/100 pieces.

Vise with special jaws.

Cutters— Two 5" half side mills.

Again in this operation, the setup is worthy of mention. First, because the table has been brought close to the column face and with it the cutter. In addition, the arbor support hugs the cutters and thus provides a rigid table setup, both for the cutters and the machine.

The vise holding six workpieces is equipped with special jaws. One jaw has a straight side and the other has six Vshaped notches to hold the door latch pins in a vertical position for the cut. If the shanks on these workpieces varied more than a couple of thousandths of an inch in diameter, this holding method would have to be rejected. However, the shanks on these pins have been previously turned and held to sufficiently close limits so the combination of a V and a straight-sided jaw will hold each of the six pieces rigidly and solidly. Thus, there is no tendency for the straddle mill cutters to pull any of the workpieces out of the vise as would be true if any were undersized. (See Fig. 19).)

Mill Seven Clutch Teeth

Seven clutch teeth are milled in this workpiece made of SAE-4615 steel. A form cutter, 2½" in diameter with a 45° angle, is employed to make the cut in the workpiece. The clutch is mounted on an indexing fixture, set on the table of a bed type machine with the spindle revolving at 120 rpm. The table in this instance is feeding at a rate of 12" per

SHORT CUTS WITH POWER GRIP

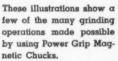
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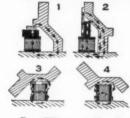






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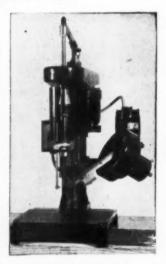
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FIG. 20-OPERATION DATA

Job Description— Mill seven clutch teeth.
Material— SAE 4615.
Machine— Simplex bed type.
Speed— 120 rpm.

Feed—
Production Rate—
8 hours/100 pieces.
Fixture—
Cutters—
2½"x45 degree angle
hs form.

minute so 100 pieces can be produced in eight hours, (See Fig. 20.).

This operation presents the use of a form cutter designed to meet the specifications of these teeth. One angle of this cutter is 45°. The workpiece is held in a special indexing fixture, which for the present job, is equipped with a seven-station indexing plate. This indexing fixture can be equipped with plates of any number of stations corresponding to the job in hand. (See Fig. 21.)

The setup is simple in other respects and is generally satisfactory. However, the operator could well have placed the arbor support closer to the cutter for greater rigidity in this part of the setup.

Milling Bearing Sleeve

In order to mill a relief in a bearing sleeve, an 11/16" end mill is set in the spindle of a light high speed universal attachment assembled on a No. 2 Plain Horizontal Milling Machine. The speed selected for this operation is 666 rpm with the feed at a rate of 3" per minute. (See Fig. 22.)

The workpiece is securely held by a chuck mounted on a Plain dividing head which permits indexing around to the various stations called for by the specifications.

FIG. 22-OPERATION DATA

Job Description— Mill bearing sleeve.

Material— Cast iron.

Machine— No. 2 Plain with light

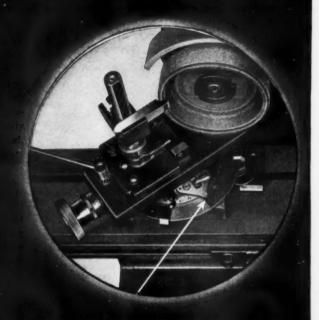
high speed universal attachment.

Speed— 666 rpm.
Feed— 3 inm.

Feed—
Production Rate—
Production Rate—
Fixture—
Cutters—

3 ipm.
7 hours/100 pieces.
Plain dividing head.
11/16" end mill.

In this operation, the operator has used his knowledge of attachments to advantage in obtaining quickly a setup that would permit economical performance of the job. The application of a chuck to the plain dividing head, too, is noteRadiform



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worthy because it facilitates loading and unloading the workpieces. (See Fig. 23).

Dividing Head Frame

This job calls for the milling of a slot in a dividing head frame made of high test cast iron. A 3" diameter by 5\%" wide staggered tooth cutter is used for the operation. The table of a No. 4 Plain Horizontal Milling Machine is equipped with an adapter plate to hold the workpiece. The cutter speed is 75 rpm while the work is being fed into the cutter at a rate of 7" per minute. (See Fig. 24.)

FIG. 24-OPERATION DATA Job Description- Mill slot in dividing head frame. Material-High test cast iron. No. 4 Plain. Machine-Speed-76 rpm. Feed-7 ipm. Production Rate-5.6 hours/100 pieces. Fixture Adaptor plate. 5/a"x3" staggered tooth. Cutters-

The operator thoroly understood the possibilities of this milling machine and so he was able to devise this excellent setup. In this operation it is impossible to mill the slot in the base of this frame by feeding the workpiece upwards and still clear the overarm. But by removing one overarm and setting the arbor support on the other, the necessary clearance was obtained. In spite of this change in setup, there is sufficient rigidity and stability in the assembly to prevent the cutting forces from springing the arbor out of position. (See Fig 25.)

Slots in Long Bearing

In order to mill three slots in a long bearing as called for in this specification. there are three high speed staggered tooth cutters mounted on the arbor of a No. 4 Plain Horizontal Milling Machine, These cutters revolve at a speed of 96 rpm while the table carrying the workpiece is moving at a feed rate of 75%" per minute. An adapter plate and clamps are employed to hold the workpieces. The production rate for 100 pieces is 26 hours. The radial slots milled in this operation are of different diameters. Staggered tooth cutters are used in milling of relatively narrow slots. such as these, to produce smoother operation and to prevent chatter. The horizontal forces acting on the staggered teeth



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2849 N. Clark St., Dept. C-64, Chicago 14, III. Representatives in principal cities and Canada are opposed and, therefore, balance each other. In this manner, side thrust on the cutter is eliminated and a smoother milling operation results. (See Fig. 26.)

FIG. 26-OPERATION DATA

Job Description- Mill three slots in long bearing. Material-Special cast iron. Machine-No. 4 Plain. Speed-96 rpm. Feed-7% ipm. 26 hours/100 pieces. Production Rate-Fixture-Adaptor plate and clamps. Three 41/2x7/16" hs Cuttersstaggered tooth.

The setup is good in this instance. The position of the table in relation to the column face, and the use of an intermediate bearing close to the cutter assembly are commendable. In this set-up, the cutting forces acting on the machine table and the arbor are properly absorbed. For this operation, the gang of three cutters is kept permanently assembled on an arbor. Thus, in a series of intermittent production runs, time is saved and the principle of economy is served. (See Fig. 27).

Dovetail In Crank Block

In this operation a dovetail is milled in a crank block with a 6" diameter high speed 30° angle cutter. A standard universal milling attachment and a rotary table are mounted on a No. 3 Universal Machine to perform the job. The cutter speed is 66 rpm while the feed selected is 2" per minute. (See Fig. 28.)

FIG. 28-OPERATION DATA

Job Description- Mill dove tail and crank block Material-SAE 4615. No. 3 Universal with Machine-Universal attachment. 56 rpm. Speed-Feed-2 ipm. 28 hours/100 pieces. Production Rate-Fixture-Rotary table. Cutterhs 30 degree angle.

By using the standard universal attachment, the circular dovetail cutter can be correctly aligned with the workpiece at the angle called for in the specification, and the rotary table enables the operator to revolve the workpiece, without change of setup through 180°, to mill a similar dovetail slot in the opposite side of the crank block.

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Mill Pad On Vertical Head

Milling pads on a vertical head, made of cast iron, is accomplished in this operation with a 6" diameter tungsten carbide face mill. This cutter is mounted on a Style C Arbor set in the spindle of a No. 4 Plain Horizontal Milling Machine. The cutter is revolving at 355 rpm while the feed is set at 7%" per minute. Under these conditions, a production rate of 20 hours per 100 pieces is maintained. (See Fig. 30.)

FIG. 30—OPERATION DATA

Job Description— Mill pads on vertical

In this face milling operation, the operator was called upon to devise a setup which would permit sufficient clearance for the body of the workpiece which extends toward the column of the machine. To do this an extension arbor was used. carefully supported at the extreme end as close to the cutter as possible. Tungsten carbide cutters need this rigid support for their successful use, because any vibration, either in the cutter or the workpiece setup, impairs their effectiveness. Therefore, in this case, the mounting of an arbor support close to the face mill cutter meets the demands of good milling practice.

Teeth in Elevating Rack

A 2¾" diameter high speed rack cutter mills the teeth in an elevating rack on this job. The material in the workpiece is cold rolled steel and a speed of 195 rpm and a feed of 7½" per minute were chos-



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en. A plain vise is used to hold five workpieces at a time. This permits a production rate of 100 pieces per hour. (See Fig. 32.)

The cutting of teeth in these elevating racks can be done in two ways, the least desirable of which, from a standpoint of economy, is this method. By the single cutter method illustrated, the operator must move the table crosswise 16 times, or once after each tooth is cut.

FIG. 32-OPERATION DATA

Job Description- Mill teeth in elevating

Material— Cold rolled steel.

Machine— No. 2 Plain.
Speed— 195 rpm.
Freed— 7½ ipm.
Fixture— Plain vise.
Cutters— 234" hs rack

The preferable way to cut these teeth would be thru the use of a gang of eight cutters properly spaced so that the distance between them would be equal to the pitch required by the specifications. With such a cutter setup, only two passes of the workpiece into the cutter would be necessary. In this illustration, the principle of economy has been violated. (See Fig 33.)

Arm Pendant Bush Nut

This operation calls for the milling of grooves in an arm pendant bush nut made of SAE-1020 steel. The workpiece is mounted on the arbor of a No. 2 Plain Horizontal Milling Machine. The cutter is revolving at a rate of 153 rpm while the work is being fed at a rate of 20" per minute, thus, making the production rate 100 pieces in 3.6 hours. (See Fig. 34.)

FIG. 34—OPERATION DATA

Job Description— Mill grooves in arm

Material— SAE 1020.

Machine— No. 2 Plain.
Speed— 153 rpm.
Feed— 20 ipm.
Froduction Rate— 20 ipm.
Fixture— 20 ipm.
Dividing head on tail stock.
Cutters— 3" form.

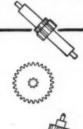
For purposes of economy, 18 of these bush nuts are mounted on a mandrel and held by plates, an end nut clamping tightly the entire assembly. The mandrel and the mounted workpieces are then

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set between the plain dividing head and the tailstock. The form cutter makes 12 complete cuts, the workpiece being indexed after each pass. (See Fig. 35).

In addition to this economy in milling practice, correct dimensions and proper cutter setup are obtained. The arbor support is close to the cutter for rigidity and the plain dividing head assures accurate spacing of the grooves.

Projections On Vise Jaws

Straddle milling the projections on vise jaws is done with a table setup and the use of two 5½x1½" helical side cutters. These cutters are mounted on the arbor of a No. 3 Plain Horizontal Milling Machine and revolve at a rate of 57 rpm. The workpiece is being fed at the rate of 4½" every minute into these cutters. This results in a production rate of 12 hours for each 100 pieces. (See Fig. 36.)

FIG. 36—OPERATION DATA

Job Description— Straddle mill projection on vise jaws.

 Material—
 Cast iron.

 Machine—
 No. 3 Plain.

 Speed—
 57 rpm.

 Feed—
 4½ ipm.

 Production Rate—
 12 hours/100 pieces.

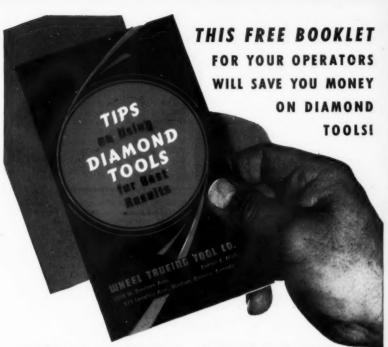
 Fixture—
 Table setup.

 Cutters—
 Two 6½"x1½" helical side.

This setup for the milling of the projections on the vise jaws may be criticized for violation of the fundamental principle of economy in good milling practice. From the standpoint of economy, a second set of straddle mill cutters should be mounted on the arbor to mill both projections in one pass. As this job is performed here, the operator did not take full advantage of the machine's possibilities in making the cutter setup. (See Fig. 37).

Mill Clutch Teeth

This job specifies the milling clutch teeth in material of SAE-4615 steel. The workpiece has been copper plated, with the exception of the teeth, in order to prevent hardening in heat treating. A 4"x21'64" side milling cutter revolving at 135 rpm is mounted on the arbor of a No. 2 Plain Horizontal Milling Machine. At a feed rate of 15" per minute, it is possible to produce 100 pieces in 6.7 hours. (See Fig. 38.)



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FIG. 38-OPERATION DATA

Job Description— Mill clutch teeth.

Material— No. 2 Plain.

The choice of a staggered tooth cutter for the milling of the narrow slots in this clutch is commendable. Since the horizontal pressures on the staggered teeth are opposed, they counteract each other, and a balanced cutter is the result. If a straight tooth cutter had been selected considerable chatter in the cut would have resulted.

The indexing fixture is equipped with a plate having the required number of divisions needed to mill the correct number of teeth in the clutch for this job. This plate can be replaced with others having more or fewer notches as the job may demand. (See Fig. 39).

Slot Internal Gear

In this operation, the application of a slotting attachment to a standard milling machine is demonstrated. The workpiece in this job is an internal gear made of SAE-4615 steel. The speed of the spindle chosen for this operation is 96 rpm while the workpiece, mounted on a rotary table, is fed by hand. (See Fig. 40.)

FIG. 40-OPERATION DATA

Job Description—
Material—
Machine—
Speed—
Speed—
Feed—
Froduction Rate—
Fixture—
Cutters—
SAE 4615.
No. 3 Plain, with slotting attachment.
96 rpm.
By hand.
29.6 hours/100 pieces.
Rotary table.
Form tool.

This setup clearly illustrates the economy resulting from the temporary transformation of a standard horizontal milling machine in a slotter. Such a transformation is a necessary consideration where the amount of slotting work does not justify the installation of a special machine for that purpose. The workpiece in this operation is mounted on a rotary table so that the gear can be indexed to the correct position for each slot. Accurate spacing is important, and the use of an index plate simplifies this task.



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FIG. 42-OPERATION DATA

Job Description-

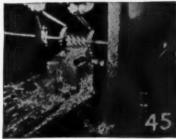
Mill 11/4" slot in spindle quill.

Material— Machine— Speed— Feed—

Speed—
Feed—
Production Rate—
Fixture—
Cutters—

SAE 1045. No. 3 Plain. 75 rpm. 25%" ipm. 19 hours/100 pieces. Radius angle fixture. 3"x11/4" interlocking.







Slot In Spindle Quill

In order to mill a 1¼" slot in the spindle quill as called for in this operation, a 3"x1¼" interlocking cutter assembly is



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chosen. The workpiece is of an SAE-1045 steel and the operation is being performed on a No. 3 Plain Horizontal Milling Machine. The spindle revolves at 75 rpm and the table feeds the workpiece into the cutter at a rate of 25%" per minute. (See Fig. 42.)

This setup is praiseworthy for the position of the table close to the column face, as well as the position of the arbor support with regard to the cutter. In this operation, the cutting forces are relatively large and must therefore be directed against the various units of the milling machine when placed in the most advantageous position. The cutter assembly is well supported to counteract such forces as may tend to spring the arbor when the tooth cutter engages this workpiece.

Moreover, the choice of the staggered tooth cutter is good because it will assist in breaking up the chips that otherwise would build up considerable pressure in the narrow slot between it and the workpiece. Such chip pressure would tend to spring the arbor.

Note the simple fixture. The angle plates are bored to the required diameter and the workpiece is quickly and easily located. (See Fig. 43).

Milling Yoke

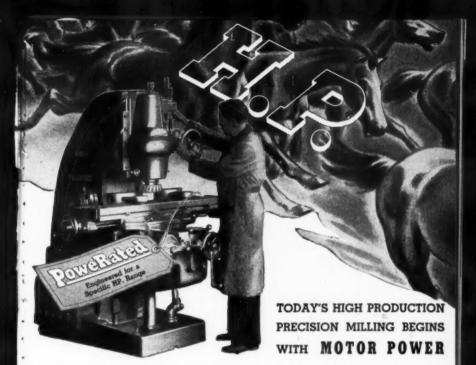
This operation calls for the slab milling of the bottom and the straddle milling of the side of a yoke. This yoke is an SAE-1045 steel forging and is mounted in a special fixture on the table of a No. 4 Plain Horizontal Milling Machine. The assembled cutter revolves at the rate of 57 rpm while the workpiece is being fed at the rate of 1½" per minute. The side mills of high speed steel are 6" in diameter with a ½" wide face while the helical slab mill is 3" in diameter with a 4" face. (See Fig. 44).

FIG. 44—OPERATION DATA
Job Description— Slab and straddle mill

Material-	
Machine-	
Speed Feed	
Production	Rate
Fixture-	
Cutters-	

yoke.
SAE 1045 steel forging.
No. 3 Plain.
57 rpm.
11/8 ipm.
17 hours/100 pieces.

Special. 3" spiral slab mill 6" side mill.



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The milling setup for this operation is good. The table is close to the column face and the intermediate arbor support close to the outside of the cutter assembly. This stiffens the arbor, thus preventing springing under the heavy cuts called for by this operation. Since the voke is a steel forging, it is properly milled in conventional style. Thus the cutting edges do not come in contact with the scale on the surface of the forging as they would if the yoke were milled by the climb method, (See Fig. 45).

The fixture used in milling this yoke is a sturdy holding device that does not permit distortion of the workpiece. Its jaws have knife edges that pierce the ends of the yoke to grip it firmly. The movable jaw to the right is set at an angle so that when tightened it not only pulls down but in as well. (See Fig. 46).

Splines On Clutch Shaft

To mill the splines on a clutch shaft of 4615 steel. 21/2" diameter spline cutters are mounted on the arbors of a duplex bed

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H. B. ROUSE & COMPANY 2214 N. Wayne Ave., Chicaga 14, Illinois type milling machine. Special indexing heads are necessary in order to space and mill the splines accurately. The spindles are revolving at a rate of 106 rpm while the table is feeding the work at a rate of 5½" per minute. The production rate is 22 hours for 100 pieces. (See Fig. 47).

FIG. 47-OPERATION DATA

Job Description—
Mill spline on clutch shaft.

Material—
Machine—
Speed—
Speed—
Freed—
Production Rate—
Production Rate—
Special indexing heads.

21/2" spline.

Cutters-

The climb milling of these splines is necessary to insure the elimination of a burr on a top edge of the spline. We have already seen that where a cutting edge enters a workpiece, it leaves a sharp clean-cut edge. Where it leaves the workpiece, a burr results. Climb milling is, therefore, properly used on this job to avoid a ragged spline cut edge. (See Fig. 48).

Because of the length of the cut and the tough steel to be milled, a large amount of coolant is used in this operation. It helps to keep the cutters cool and prevents excessive distortion from the heat generated by the cut. Note, also, in this illustration the adequate support given the long shafts. Without this center support, the cutting forces would deflect the shafts downward away from the cutter, preventing accuracy in the finished piece. (See Fig. 49).



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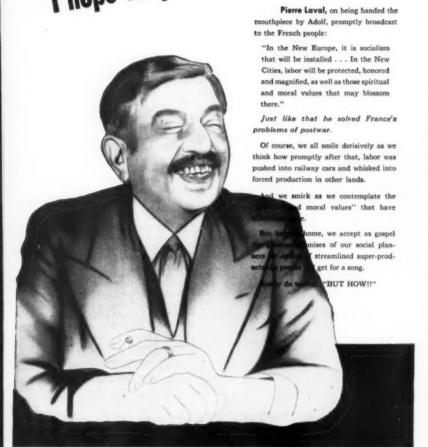


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THESE trenching machine sprockets of welded design (on right) cost \$21.55 (large one) and \$13.25 (small one). Costs for the former designs (on left) were about 30% higher. Weight has been cut a like amount. By recourse to arc welding, engineers are making similar savings and improvements for part after part of the machine.

The design and manufacture of this and other parts of this machine are discussed in a new series of Lincoln Studies.

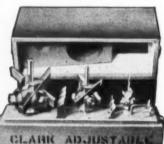
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Rim is rolled hot, welded with double V-butt joint and teeth are flame-cut. Web consists of two flame-cut, dished plates. Hub is bar stock.

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Contents of Clark Hole Cutter Set CD-3

Model No.	Shank Size	Expansion Capacity*	Thickness Copacity
00	36" S.S.	96" - 134"	36**
1	14" S.S.	1" - 21/1"	34"
3	1/2" S.S.	2" - 31/2"	36"

An extra set of blades included for each cutter.

*Other Clark Cutters covering diameters to 10"

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are available.

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You have a tool crib at your elbow when you're using Clark Cutters. In electric drills, portable air motors, lathes and heavy drill presses, one Clark Adjustable Hole Cutter replaces many fixed-radius tools. Only three tools cut all diameters from %" to 3½". Get a smooth finish the first time without filling or de-burring in steel, hard fibre, plastics, wood and other materials. From thin sheets to %" stock. Phone your jobber for a demonstration.



Adjustability! Simply loosen locking bolts, slide blades in or out to desired diameter and tighten bolts.



Versatility! Threeblade design makes Clark Cutters efficients in partable or benchtype equipment.



CUTTERS

Cutting Tool Booklet. Ask for Bulletin No. MTBB-6.

Mass Production of Small Fine Pitch Gears

B RINGING mass production methods such as "gear-shaving", along with extremely high standards of precision into the field of manufacturing small fine-pitch gears for high precision military instruments, the Ford Motor Co., Detroit, Mich., has once more enabled this country to prove its superiority over Axis-dominated industry in the turning out of vital war equipment quickly in vast quantities.

gun director — a mechanism consisting primarily of small fine pitched gears of which there are some 750 different gears.

To attain the goals of high precision of parts and of mass production, the High-land Park Plant of Ford Motor Co., developed a production and checking cycle somewhat unique in precision geer manufacture. For instance, the process has been built around the use of relatively

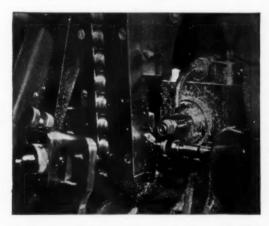


Fig. 1—Barber-Colman Type "S" hobbing machines are among machines used by Ford for roughing the small gears.

The gears, used in the mechanism of modern automatic mechanical anti-aircraft gun directors, first, must be light in weight to reduce their inertia because these mechanisms often operate at very high speeds. Such gears also must be sturdy, and highly resistant to corrosion. On top of all this, they must possess a degree of precision which heretofore could be attained only in custom-built instruments.

The accuracy of anti-aircraft fire depends upon the accuracy of the gun directors. This, in turn, depends on the accuracy which has been built into the unskilled labor. Moreover, the same equipment is used for finishing all gears from ¼ to 4" in diameter. The finished gears are held to .0003" on the bore of the gear, a specification of .001" on the pitch diameter (Fig. 5) and very accurate for tooth form and spacing. Actually, most gears came off the shaving machines within a half-thousandth on pitch diameter.

All gears, are of the spur type and are made from either duralumin or stainless steel. All gears are from 32 to 64 pitch. Some run to less than ½" in diameter and many have only 9 or 11 teeth. They are

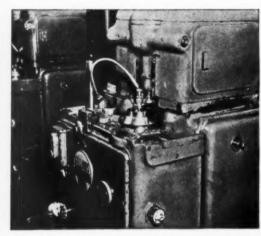


Fig. 2 — Shaping anti-aircraft gun director gear on a Fellows Gear Shaper prior to finish shaving. Six seconds is required to shape one tooth.

blanked from bar stock on screw machines, a tolerance of 0.001" being maintained in this operation. The blanks are then precision bored on Borematics, tooled with cemented carbide tipped tools to facilitate holding the bore of the blanks to the required tolerance of .0003" in con-

tinuous production. The minimum face run-out is also of extreme importance, a tolerance of even .001" per inch of radius being too coarse for these gears. Most of the gears in production ran around .0005" for face runout in production.

For "roughing" the gear teeth, hobbing



Ultra-precision gear finishing is done on these Michigan gear shavers. Special "run-out" checking device used on 100% of finished gears is shown at left of machines.

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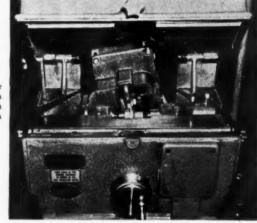
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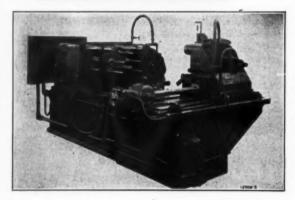


Close-up of a 48-pitch gear being finish-shaved on a Michigan 861-4B. Finish is so high that burnishing is not required,

machines equipped with Mitco hobs, gear shapers, and straight line gear generators are used. All gears of less than 1" diameter are "roughed" on the gear generators. The general practice on the other gears is to employ Class A Michigan hobs in







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The Model 31/2 x 24 Horizontal Hydraulie Food Multiple Spindle Fully Automatic Cyeled Machine was developed to step up production rates at a minimum of operator fatigue and effort. The Unit Multiple Head earries 15 spindles; 8 at the front station for drilling from the solid and rough boring center large bore; 7 spindles at the rear station for finish boring and finish counterboring.

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Checking pitch diameter of gear over wires. This measurement is held to .001".

order to obtain the maximum degree of accuracy before the parts go on to the gear shaving operation. In all of the "roughing" operations, the amount of stock left to be removed by the finishing process is held to .002" or less, measured over wires. This means that gears are hobbed to the high limits permissible in "finished" gears and then are shaved to

the mean of the final gear tolerances. Fig. 1 shows how such small gears are hobbed by Ford on Barber-Colman Type S hobbing machines, the actual photo, however, having been taken in the Barber-Colman plant.

In shaping these small fine-pitch gears prior to the finish shaving process (Fig. 2), perhaps the most difficult job is the

How to Speed Up Milling and Drilling



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Cutter No.	Diameter	No. Blades	Price
7106X	6"	12	\$58.00
	_	12	\$58.00
7108X	8"	16	75.00
7110X	10"	20	100.00
7112X	12"	22	120.00

TYPE NX (Below) Heavy Duty Series face milling cutters designed for general purpose work are suitable for taking ½" cuts on both the face and periphery in cast iron or steel. Serrated high speed steel blades are blocked in the cutter housing by wedges and screws. Chip clearance is milled in the housing to prevent chips clogging on heavy cuts. The following sizes are available in stock both right and left hand:

Cutter No.	Diameter	No. Blades	Cutting Face on Periphery	Price
8104X	4"	10	1-3/4"	\$30.00
8106X	6"	10	2-1/2"	35.00
8108X	8"	14	2-1/2"	45.00
8110X	10"	18	2-1/2	60.00
8112X	12"	20	2-1/2"	78.00







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· Gear Cutting milling, slot cutting, etc. They have been used successfully in gear cut-ting and hobbing.

Any type of bit can be inserted and adjusted quickly. Complicated cuts are broken down into simple units by grinding each bit for a portion of the job. The Newfield fits all standard arbors, turns to any required speed, and is made in 4, 6, 8, and 10" sizes. The 10" size provides 6 tool positions.

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complete details.

NEWFIELD MACHINE PARTS 7160 Metrose Ave., Los Angeles 46, Calif. setting up of the machines to obtain the extreme degree of accuracy required. Arbors must run true and for this reason floating arbors are used on the shapers. It requires six seconds to shape one tooth. and the accuracy of tooth form of the shaped gears-prior to the finish shaving -equals the accuracy of conventional finished gears.

The gears are finished on a battery of 10 Michigan 861-4B gear shavers, part of which are shown in Fig. 3. Gears are mounted on arbor between centers as shown in Fig. 4. These gear shaving machines make use of the crossed-axis principle of gear shaving to obtain a cutting action between the faces of the cutter and the gear to be finished. For this purpose, the cutter has serrated teeth to remove stock from the involute portion of the gears. In the finishing operation, this serrated cutter is meshed in a crossed-axis position with the gear which it drives. first in one direction-and then in the opposite. In this manner, the face of the gear is moved across the contact area of the cutter, while the center distance is gradually reduced to bring the gear to the correct desired size. It requires about one minute to finish the average small fine pitch gear in the Ford operation.

Adjacent to each Michigan gear shaving machine (Fig. 3) is a special checking fixture, developed by the Ford Motor Co., to insure the accuracy of the product. This device checks the finished parts for run-out on the pitch diameter against a master gear. Maintaining a constant and correct amount of pressure between the gears is of extreme importance. This is insured by use of a sliding block carrying the shaft on which the gear being tested is mounted. The angle of the block -and therefore the amount of pressure which is exerted due to gravity-can be increased or decreased at need. All finished gears are checked 100% on this equipment.

The finished gears are not hardened but they are subjected to a chemical surface treatment for rust prevention. Originally, gears were burnished after shaving, but the high finish as well as accuracy obtained by gear shaving machines demonstrated that precaution was unnecessary.

deas for design-engineers-in these uses of S.S. White Flexible Shafts

POWER DRIVE flexible shafts have made pro-TWEK DRIVE nexible shafts have made practical the development of time and labor saving and the development of time and the saving and the sav tical the development of time and labor saving performing the same of the performing of the performing of the performing of the performed in the performance of the performance of the performent of the performance of the pe

ween commutator segme.
With this tool the operation can be performed in tion can be performed in contined space and with-contined space and orma-out removing the brush ture or even the are crms. arms. Maybe there or in operations carried on in your plant that could be your faster and more done conomically with a flexible shaft machine de-signed for the purpose.



Photos courtesy of Martindale Electric Co.

showing typical POWER DRIVE and REMOTE CONTROL

COUPLING - In this Diathermy Unit (cover re-DUPLING — In this Diathermy Unit (cover removed) a remote control type flexible shaft "couples" a condenser in the left rear to its control knob on top. Obviously use of the shaft makes it possible to place the condenser in best position for assembly and wiring, and she control knob where the condenser in best position for assembly and wiring, and the control knob where the condense and the control knob where the condense are the condense the in best position for assembly and wiring, and the control knob where operating convenience says it should be Coupling with S. S. White flexible shafts is an idea to remember when an idea to remember when the control of the control tlexible shafts is an idea to remember when designing cabinet type radios, television units designing cabinet type radios, relevision units or any other equipment containing elements which require adjustment during operation.

Photo courtesy of Burdick Corp.

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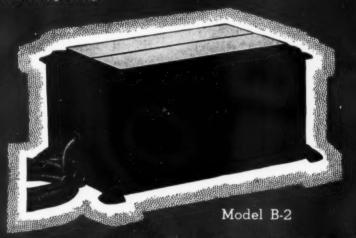
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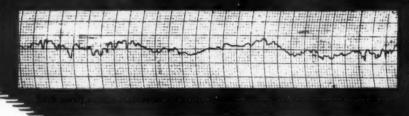
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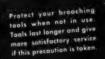
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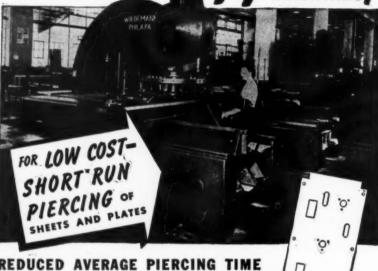


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Special Grinder Applications

By JOHN E. HYLER

DORTABLE grinding attachments are by no means to be considered as displacing large and well-designed grinding machines. The exceptions are cases of jobs being done at what represents a real production loss on some larger machines that were never designed for the particular jobs. It is, however, really remarkable to what extent these little portable attachments have increased the overall efficiency and especially the versatility of machine shops in general. Because they can be applied readily to shapers, to planers, to lathes, and to milling machines, as well as to other machine tool units, they represent a most remarkable means of eliminating down time for any machine that may be able to keep ahead of the work alloted to it. Most of the better machines in the shop become grinders on part time, when it is necessary to relieve grinding machines that are already overburdened, or to keep operators going who would otherwise lose time.

Small grinding attachments are made in different models, particularly applicable for use in connection with certain ma-

chines. Naturally, lathe mountings have been quite numerous, for the lathe lends itself quite well, in connection with such grinding units, for various types of external and internal grinding. One proposition that is highly interesting is the use of a thread grinding attachment for a portable grinder applicable to a lathe. Two views of this type of lathe threadgrinding work are shown in Figures 1 and 2. In Fig. 1, the thread on an armature shaft is being corrected, after having been distorted in hardening. The workpiece shown in Fig. 2 is a highspeed boring tool, and on this also, the threading was distorted during hardening and drawing. However, it should be noted that while such attachments are much used for corrective work of this type, they may be and are used in some measure for grinding threads directly from the solid.

A special mounting post is used for thread grinding work, the post being locked in the T-slot of the lathe compound. A special thread-grinding wheel is required, and a special wheel-dressing device provided, the latter being clamped

Fig. 1—Finish grinding an armature shaft thread to size on a lathe with thread grinder attachment. The thread was distorted in the process of hardening.

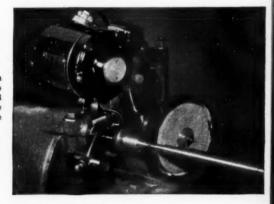
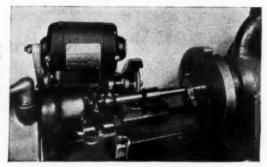


Fig. 2—Using a portable attachment to grind the threads of a high speed boring tool. The tool was hardened and drawn and thread was found to be distorted. By means of the attachment the threads were reground at a worthwhile saving.



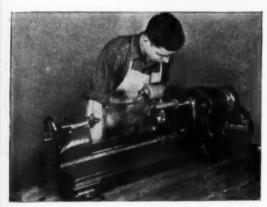


Fig. 3—Here is a 1/14th hp unit, grinding lathe centers. This is just one of many useful applications of the versatile portable grinder.

to the tailstock of the lathe. Clamps for this dresser can be seen in place on the tailstock. It is, of course, necessary to set the wheel, and also the dressing tool, at the proper helical angle to agree with the thread being produced or corrected. The grinding wheel also must be on a horizontal center line with the work. The mounting post is slotted to allow setting the grinder to the horizontal center line.

The grinding of tapers on a lathe, with a grinding attachment suited for mounting on the lathe compound, and carrying its own motor, is a relatively simple proposition. Such an attachment in very small size, dubbed the "Tom Thumb" by its maker, is shown in Fig. 3 on a center grinding job, mounted on a lathe. A



Fig. 4—Here is a precision job grinding the face of the valve to close tolerance.



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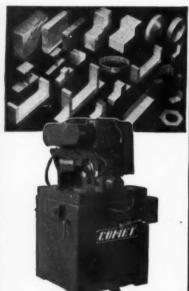
The Atlas Shaper, for example, does all shaping work within a seven inch stroke . . . does it with the accuracy, power, and strength of larger machines. Angular, vertical, horizontal and V-cuts, dovetailing, keyseating, and internal operations are all in the day's production for this rugged compact machine.

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AUTOMATIC CUT-OFF MACHINE MODEL MH

larger attachment, mounted on a larger lathe, is seen in Fig. 4 on a high precision job, viz., refacing automobile valves, and working to very close tolerances.



Fig. 5.—This is an interesting example of what can be accomplished on a surface grinder. The job involves grinding the edges of a glass shearing blade to close tolerances.

A surface grinder can be used to grind edges on special tools if provided with an arrangement like that shown in Fig. 5. The answer once more is a special porttable grinding attachment. This is the same grinding attachment used in the thread-grinding applications, but here it is fitted with a different mounting and a different type of wheel. Incidentally, the same grinder accommodates a considerable number of different quills for various types of internal grinding. The tool held in the fixture mounted on the table of the surface grinder is a glass shearing blade, used for cutting off molten glass before it enters a highspeed bottle-making machine. The method of grinding the edges is so evident from the picture that no further comment is needed. but it is a highly interesting example of what can be done.

Fig. 5 is an instance of what can be

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1 Sectional view shows sliding carrier-sleeve on camshaft with cam and lock-pin removed.



2 Cam slips easily into place on shaft with slots in alignment with keyways.



3 Sliding carrier-sleeve, with keys attached, quickly locks cam in position on shaft.



SMALL CAM INVESTMENT HANDLES 90% OF AVERAGE JOB-SHOP REQUIREMENTS

The following list of standard crossslide cams are all that are usually needed for one machine to serve a wide range of feeds and strokes:

Qua	n	ŧ	i	y	1							9	۲	à	am	Ratios
9	١.															2:1
3	١.															3:1
3									*							4:1
2																5:1
3										į.			ï			6:1
1																8:1
- 4																"wt-Off

TOTAL INVESTMENT. ONLY \$131.35
*Cams are made in ratios to tool-

*Cams are made in ratios to toolslide feed and stroke. For example, 2:1 = 1/2 feed and 1/2 stroke.

STANDARD INTERCHANGEABLE CROSS-SLIDE CAMS CUT TOOLING EXPENSE

Simplicity of design makes it possible, today, to operate Greenlee Automatics effectively on more than just the ordinary "cut-and-dried" multiple-spindle screw machine jobs. The cross-slide cam feature on the Greenlee, for example, promotes production efficiency on many short-run jobs by reducing set-up time and through savings in tooling expense.

As shown in top photos, individual cams (only one used for each independently operated cross-slide) are quick and easy to slip on or off. All cams are completely interchangeable and may be used on any cross-slide. Thus, only a very few are required to serve a wide range of jobs.

There are other time-saving, cost-saving Greenlee features, too, that offer production advantages in building weapons of war or products of peace. Ask for latest details. Perhaps Greenlee engineers can help you tie in war demands, today, with your peace conversion plans. Write—

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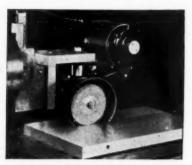


Fig. 6—Grinding a flat surface to precision tolerances with a portable grinder mounted on head of a shaper.

done when the surface grinder has idle time that can be absorbed by tooling it for out-of-the-ordinary work. Fig. 6 is an instance of the opposite aspect, where there is not enough surface grinding equipment on hand to keep up with things when the peak demand is on. Consequently, the same type of grinder is mounted on a planer, with the help of a suitable angle plate, and used for surface grinding, while the planer table reciprocates the work. With a bit of thought, you will doubtless remember instances in your own shop where this idea would have saved considerable waiting time on some job that was tied up waiting for the surface grinder.

Whether you choose to call the machine in Fig. 7 a boring mill or a vertical turret lathe, you probably never thought of it as an internal grinding machine, and yet why not? The operator is getting along "swimmingly" with an internal grinding job. The builder of the machine designates it as a vertical turret lathe. tho many refer to it as a boring mill, because of its very close similarity. The special grinding attachment shown in operation is a heavier and more powerful one than the others we have seen, but some are available which are somewhat heavier and more powerful than the one shown in Fig. 7. This particular one is fitted with a % hp motor. The workpiece is a steelextruding cylinder. You will notice that the grinding unit is equipped with an

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designed for simple automatic indexing when duplication of operation on any number of faces of work is required

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_	No.	Range of Bores Taken	Net Price	
	1A	1/2" to 1"	\$12.00	
	2A	1" to 11/2"	16.00	
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	4A	2" to 3"	40.00	



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Adapted for work with both short and long bores.

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2x	9/16" to 21/32"	11.00
3x	21/32" to 3/4"	12.00
00	3/4" to 7/8"	14.00
0	%" to 1"	16.00
1	1" to 11/4"	18.00
2	11/4" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 21/2"	40.00

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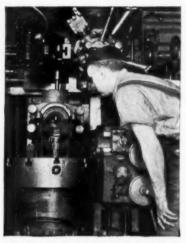


Fig. 7—Here a 3/4 hp unit is grinding a steel extruding cylinder with three bearing extension quill mounted on a boring mill.

exceptionally long quill, to enable it to reach the work properly.

These are just a few illustrations of the many jobs that can be performed with portable grinding attachments, by applying them to various machines. Doubtless, as you examine these, many other workable ideas will come to your mind. Internal grinding of all kinds at the lathe with these devices is ordinary. By arranging a wheel on dead center of a piece of work mounted in a chuck or on a faceplate, a spherical recess can be ground readily, or one that has been turned can be trued up. There is little doubt that in years to come, these little machines will find even wider application, and will reduce many complicated processes to a more simple basis.

Photos-Courtesy The Dumore Co., Racine, Wis.

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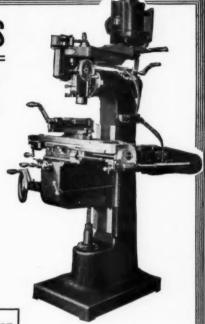
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TIPS ON FIGURING DEPRECIATION

By ARTHUR ROBERTS

I T MAY be difficult to get new equipment today, but the postwar period is approaching when taxpayers will consider trading-in old equipment for replacements. Undoubtedly, many trade-in transactions will take place at that time so the handling of trade-in allowances for tax purposes is worth white space now.

To illustrate, let's take equipment costing \$1,500, with an estimated life-span of 10 years, which has depreciated \$750 in five years. It is traded in for other equipment costing \$3,000, with a trade-in allowance of \$1,000, or a net outlay of \$2,000. The new cost for depreciation write-down is \$2,000 plus \$750, the unrecovered cost of the old equipment, or \$2,750. The trade-in allowance is not considered.

Some taxpayers assume that because they get credit for the unrecovered cost of the new equipment traded in, it makes

no difference whether their deductions for depreciation are accurate or not. Sound accounting demands that costs be charged to the year in which incurred. Hence, if your depreciation rates are too low now, you are not following sound accounting practices. Moreover, you lose the benefit of the immediate deduction and must string the unrecovered cost over the life of the replacement. Then if you still follow the same routine and short-change yourself on the rates you fix on the new equipment, you will have another hangover when you subsequently replace it with new equipment and you will not receive the full credit due until you finally decide to estimate depreciation with greater accuracy.

When using straight-line depreciation, consider salvage value when fixing the rate. For example, equipment costing \$5,000, with an estimated salvage value.



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31 W. 47th St., New York 19, N.Y. Branches: London; Bahia, Brazil at termination of write-downs of \$1,000, leaves \$4,000 to be depreciated. If the lifespan is 10 years, the annual write-down is \$400. Do not expect to estimate the salvage value to the penny when setting the rate. I have never known a case where the cost of the equipment, less salvage value, equaled the write-down at termination. You must make an adjustment at termination in all cases, if my experience is any criterion. Any excess value received for salvage over the book value must be reported on your return as miscellaneous income.

New trucks, new machines, new flxtures, new office equipment and all other types of business appliances will be coming to market in the postwar period. Whether you use composite accounts where all depreciable assets are included in one depreciation reserve: classified accounts where assets are segregated into class groups, building, machinery, delivery equipment, etc.; group accounts where assets of a similar kind with approximately the same average useful lives are included in one account or item accounts where individual records are kept, showing the cost or other basis and depreciation reserve for each item of depreciable property, this counsel anent trade-in values and salvage is worth considering now. Review your depreciation rates to make sure you are taking reasonable deductions in line with prior experience. If you can justify an increase in the rate, the Treasury Department may permit it and even if disallowed, you should know where you stand. Do not be lulled into calm security because unrecovered cost of the old equipment may be written off subsequently when replaced with new. Machine tool users have a lot of money tied up in depreciable assets and only a five per cent differential may cut deeply into profits or net worth, if depreciation is figured that much short of actual wear, tear and obsolescence.

Many taxpayers do not compute depreciation on buildings, garages, warehouses and loft buildings accurately. Two methods are permitted:—(1) Lumping the building and its building equipment in one total for annual charge-off; (2) Separating the building is:elf from its equipment. Under the first method, when setting the over-all depreciation on building



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Positive in opening and easily adjusted to any thread cutting operation within their capacity, these die heads are perfect for use in a stationary position on hand screw machines, turret lathes and other machines.

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MODERN TOOL WORKS

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and equipment at the start, the extent to which the equipment such as elevators. heating, plumbing, electrical wiring and fixtures, must be replaced, is important, The rate used by the taxpayer under this method contemplates that the cost of the equipment replaced will be charged to the depreciation reserve. Where the original cost of the equipment cannot be determined, cost of the new equipment may be charged to the reserve. Taxpayers who contemplate expansion in the postwar period will do well to give this phase of their tax problem careful study. The accompanying table of composite rates gives figures considered reasonable when depreciating a building and its equipment in one sum.

	Good	Avg.	Cheap
Warehouses	2	21/4	3 percent
Machine shops	2	21/2	3 "
Garages	2	21/2	3 "
Loft buildings	2	2	3 "
Factories	21/4	234	3 "
Office buildings	2	21/2	3 "

Under the second method, the building and its equipment carry separate accounts for depreciation purposes and then these rates are considered reasonable.

																ear
Warehouses																
Machine shops																
Garages																60
Loft buildings					4		*	*					*			67
Factories										*	*			*	*	50
Office building	8															67

In other words, you are permitted a higher deduction if you lump equipment and building in one write-down. When the building is set up as a separate account for depreciation purposes, it has a longer life-span and therefore carries a lower depreciation rate, according to the Treasury Dept.

The reason, it seems, is that the depreciation rates on heating systems, transformers, compressors, etc., are higher, so to equalize matters, the government has increased the rate on the building because you take advantage of the higher rates on equipment by writing this off separately. Some building equipment, such as water heaters, can be written off in 20 years, refrigerating compressors for air conditioners in 20 years and freight

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elevators in 25 years. Therefore, despite the fact that you may be permitted to write down the building and its equipment, as one unit, in a shorter time than when splitting the write-down, it may pay you to take the longer life-span on the building alone. It all depends upon the facts in the case but it is worth consideration.

Capital Assets

Recently a machine tool user called my attention to what he thought was an error in an income tax guide. The writer of this book stated on one page:—"Capital assets include stocks, bonds and other securities held for investment or speculation, land or other property owned by the taxpayer with the exception of property used in a trade or business that is subject to depreciation".

On another page, where he explained the handling of deductions for depreciation, the writer stated that in general, capital assets, buildings, machinery, furniture, automobiles, etc., used in business, are subject to depreciation.

In the former case, this guide referred to the definition of capital assets created by the Treasury Dept. In the latter case, capital assets refer to the accounting term, namely, an asset used in a business for a long period of time. Other machine tool users may be confused by this dual interpretation of a capital asset so I offer this explanation to clarify. In the future, when considering advice anent capital assets by word or printed page, make sure you know whether the term is used in the accounting sense or as the govern-

ment defines it for computing taxable gain or loss.

Tax Calendar

In a previous article. I mentioned the importance of keeping a Tax Calendar. I repeat the suggestion again, because some small machine tool users have told me they that this advice applied only to the big fellows. It is true that large concerns, with a number of employees working on tax returns, must prepare calendars showing due dates for filing. However, individual businessmen today have Federal. State and even city income taxes to pay. Also sales taxes, excise taxes and many other types of tolls. Hence, a systematic forecast for preparing and filing returns and payments is essential. To fail to file an income tax return or file late means a penalty. Even the small businessman has too many returns and reports to consider thruout the year so it is unsafe for him to rely on memory alone. Recently I listed the taxes or reports that one small businessman in New York state had to prepare or file and these totaled more than 40. In all states, even small taxpayers have at least as many returns to file; in some states more. According to the National Education Ass'n, Washington, D. C., there are 175,000 taxing units in this country so it gives you an idea of the importance of keeping tabs on taxes with a tax calendar.

File in advance of due dates, if possible. You may include taxes on property or other local levies not connected with income or sales. Leave blank lines for revisions in the law or additional returns so as to eliminate the re-typing of the tax calendar to take care of such changes.

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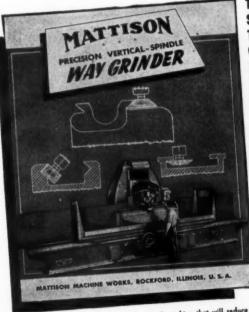
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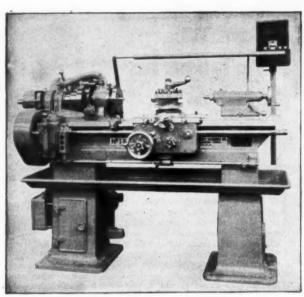
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THE FOREMANSHIP FORUM By Edmund Mottershead

REDUCING WASTE OF MACHINES, EQUIPMENT AND FACILITIES

MACHINERY, tools, equipment, power, space, and other facilities offer great potentialities for reduction of departmental waste. Most plants make the foreman a party to the selection of the machines and equipment for his department in the first place. This means that the foreman must have sufficient knowledge of the capacities and operations of various machines to select those which will deliver the required performance.

Machine time is valuable. Machines represent investment of a considerable amount of money upon which interest must be paid and depreciation computed. Taxes must be paid upon machinery. Machinery occupies space upon which rent and other overhead costs must be paid. When all these factors are added together, we find that a machine which may have 10 years of useful productive life will actually cost the company just as much if it stands idle for the 10 years, producing nothing at all.

Idle machine time is traceable to various sources, including lack of business, poor

planning of the work, accidents and sickness of operators, failure of power, material shortages, and other factors. The thing to remember is this our industrial activity is based upon mass production thru use of labor saving machinery; the more dependent we become upon the productivity of these machines, the more important it becomes that the machines be operated with the least possible loss of time. These considerations, which are of paramount importance in times of normal production for profit, are of even greater importance today when every ounce and inch and unit of production is demanded for the war effort. Idle machines, wherever found, are "soldiering" on the job.

It is the function of management to see that each piece of equipment is properly designed and that it has a capacity equal to the anticipated operating demands. It must be installed properly, with the layout and handling arrangements as efficient as possible. The operators must be trained and should understand the use of the ma-





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chines. Production scheduling should be such that the maximum utilization comes from the equipment. Finally, the equipment must be properly and adequately maintained. Waste of equipment and machinery may be attributed largely to improper operation or to inadequate maintenance and makeshift repairs.

The waste of equipment thru improper operation may be controlled at least in

part by:

1—Failure to attain capacity—The proper capacity rating should be established by careful study of every machine and piece of equipment in the shop. This capacity should not be the emergency peak load that the equipment can handle for any given time, but the normal capacity for the equipment designed to give it maximum operating life at the lowest cost.

This capacity rating should be set as the standard of performance for it, and the scheduling of production should be such that movement of materials to and from the machine will permit normal production at the established rate.

The workers, in turn, should be fully instructed, coached, and supervised as regards capabilities of the machines, instructed as to maintenance and how to keen them operating at proper rated out-

put.

2—Failure to shut down machines when idle or otherwise temporarily unproductive—A study should be made on each machine to determine the make-ready and start-up cost as well as the idle running time cost. Then, both foreman and operator will know whether it is more economical to shut down the machine during an idle period or to let it continue running. Machines running idle consume power and lubricants, and wear-and-tear continues on the moving parts.

3—The operator should assume at least reasonable responsibility for proper care of his machine—An inspection cycle or regular routine for the operator should be established so he will know what inspection should be made before starting up, when machine is running, before shutting it off, and after stopping it. He should know what adjustments to make to sustain quality of production, and at the same time avoid wear-and-tear on cutting

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You will find the Gorton 81/2D Duplicator the tions brought additional savings. ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, GOTTON Duplicators are paying for themselves in savings effected.

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Lubrication routines should be established. The workers should be fully instructed on oiling and greasing. Good housekeeping and good order around machines, are important, not only from an inspection and operating standpoint, but also from a safety viewpoint as well.

Some system should be established in the shop whereby the workers will report any defects or conditions that need repair or correction. This should be periodic and also allow for attention to situations as they need correction.

Only trained and authorized persons should be permitted to run machines of any kind, thus preventing needless injuries and damage to persons, machines, and material. Where a particularly delicate or expensive piece of equipment is involved, it may be wise to put tags or labels on controls of the machines, readily visible to anyone, listing names of individuals who are permitted to operate it. Operators, of course, should know the hazards and adhere closely to all safety practices and precautions established for operation.

Waste of equipment and machinery thru inadequate maintenance and makeshift repair may be controlled by observing that:

1.—The proper maintenance of a machine requires constant and rigid inspection by the operator, the foreman, and the regular maintenance man assigned to the department. This includes inspection of the machine itself and any auxiliary equipment used.

Parts of machines must be kept tight to eliminate unnecessary wear and vibration. This means that all loose bolts, rivets, connections, and the like require regular inspection and care. Loss of power and fuel must be prevented by checking valves and packings at regular intervals for leaks.

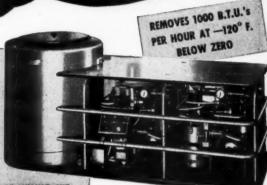
Selection and use of the correct lubricants for machines is essential. It does little good to oil or grease dirty moving parts. Machines should be kept clean, and the correct lubricants used in sufficient but not excessive amounts. Not only the visible, but also all hidden parts should be inspected, maintained and kept clean.

2-Sufficient repair parts should be on hand, not only for regularly scheduled



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The answer to this question will depend upon the products being manufactured and the processes employed in your plant. However, we can tell you here that others are using Deepfreeze to cold treat tool steels for increased hardness, and cutting tools for increased tool life, to stabilize gauges and precision instruments, to test flying instruments and accessories and for shrink-fit assembly. Limited space prohibits a more detailed explanation. but you can secure complete details on how to apply Deepfreeze cold treating to your production by merely letting us know what you're producing.

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repairs but also for emergency breakdowns.

An excessive inventory of repair parts and materials is wasteful, especially in wartimes. Temporary repairs, as such, are often of uncertain value, and may even be said to be a frequent cause of machine waste in industry. All too often "temporary" repairs are forgotten, only to be recalled later as the cause of a serious breakdown or accident.

It is entirely possible to "over-repair" equipment. Each piece of equipment has a certain useful life, will eventually wear out, and to repair it beyond the point of usefulness is a waste. A new piece of equipment to replace the old one, if obtainable, will pay dividends in the long run. During the war emergency, it has been necessary at times to patch up old machines.

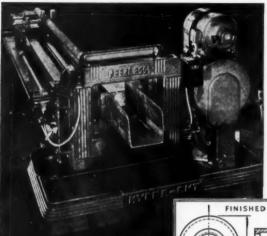
When machinery will be idle for one reason or another for any length of time. it should be cleaned, oiled, and inspected. Then it should be protected from weather, dust, dirt, and other conditions that might reduce its usefulness, so when needed again it may be as useful as before.

In considering the problem of eliminating waste of power, steam, air, water, coal, heat, and other facilities, we find that the major causes of waste in these areas fall into three classifications:-leakage due to poor maintenance and inadequate fittings: inefficient use of the power or facility due to poor engineering or design or lack of knowledge; and misuse due to carelessness or neglect because the value of the facility being wasted is not appreciated. Thus power and steam may be conserved by these precautions:

1-Electricity

The increasing drive for good industrial lighting to improve quality of production, reduce fatigue and eye strain, and thus lower costs has been an important help to production. It has contributed to safety and has reduced waste of materials, etc. However, foremen should be on the alert to prevent unnecessary burning of lights. the use of bulbs of unnecessarily high wattages and similar abuses which creep

In so far as motors are concerned, the principal sources of waste against which



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Smooth, straight-line metal sawing at high speed, with no surface hardening or fracture, is standard performance with Peerless Metal Sawing Machines. Taking as little as 1/16" for the cut, Peerless gives you more usable pieces from each piece of stock. Tell us about your toughest metal sawing operation. Fit Peerless into your postwar plans. Let's see if we can help.

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Company										Indiv	idual				
Street					m.							State			

the foremen must guard include:-the use of larger motors than required for given purposes, idle running time of motors when not in use; excessive friction load . . . poor alignment of shafts, gears, etc. Worn bearings are another cause, as are brake bands which are too tight and drag.

Leakage of electrical power may take place where there are accidental grounds in the conductor wire, the answer to which is good insulation. There should be some member, at least of the maintenance crew, who is a competent electrician. He should check wiring and installations at regular intervals to see that maximum operating efficiency is maintained.

2-Steam

Visible leaks of steam arise from poor maintenance of valves, fittings, and lines, and from simple failure to close valves properly. The invisible leaks are most often caused by poor maintenance thruout and inadequate periodic inspection of the equipment. Steam is also lost due to cooling and condensation for lack of proper insulation of the equipment.

3-Compressed Air

Leakage of compressed air occurs thru failure to close valves tightly, poor valve seats, poor pipe joints, split pipes, unsuitable packing and improper gaskets. Inefficiency and misuse are largely due to carelessness.

4-Water

The chief sources of loss of water are failure to shut off tightly when not needed, failure to reduce size of outlets to the proper size, worn valves, gaskets and packing, leaking pipes underground, etc. Regular inspection and maintenance is the answer.

5-Coal

Coal, as well as gas, oil, and other fuels,

may be conserved thru a knowledge of good combustion practices, by keeping equipment in good working order, and by preventing delays which result in heat losses.

6-Heat

Waste of heat occurs largely thru improper use. Room temperatures should be constant for healthy working conditions. Proper insulation of buildings, wellfitting doors and windows, help keep heat losses to a minimum.

WHAT YOU CAN DO

As foreman charged with the responsibility for all the machines, equipment, and facilities in your department, there are three general lines of conduct which will help you to reduce waste of these items:

1-Plan the work, not only the production of goods themselves, routing inspection and maintenance, but also layout of the machines, their installation, care and replacement.

2-Train the workers, not only in the direct performance of their jobs, but also to act as daily inspectors and guardians of the equipment, to see that it is kept at a high operating level of efficiency.

3-Educate the workers as to the value of the equipment, so they will understand and appreciate the importance of keeping the machines in good order. Use every incentive you can, from the desire for approbation to direct financial incentives. If the worker, not only understands the dollar value of his machine, but also its dollar value to him in terms of increased wages because of its higher operating efficiency, he will help you maintain it at that high level.

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What cut-off blade! has hollow ground top which permits chip to leave cut with reduced friction against sidewalls?

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What cut-off blade! is built with taper? along longitudinal cutting width to provide constant back clearance through repeated sharpenings?

What cut-off blade' causes chip to collapse, thereby allowing coolant to actually reach cutting edge?

What cut-off blade' uses a holder' that permits removal of blade without disturbing original set up?

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A new base, including a constant flow of honing fluid to the honing mandrel and stone. The flow of honing fluid acts as a coolant, carries away cuttings, and keeps the stone in sharp cutting condition. Accuracy and honing speed are considerably improved.

Adequate settling basins and baffles are provided so that no cuttings or abrasive can be pumped into the fluid lines. Flow-back pans are adjustable so that they do not interfere with the work. Pumps and coolant tank capacity are adequate to supply a constant flow of fluid.

In addition, a machine light is furnished for inspecting finish of work and for gaging completed parts.

The Sunnen Precision Honing Machine provides absolute interchangeability of parts because tolerances can be held to well within 3001" and produce holes that are honed straight and true without taper or bell-mouth.

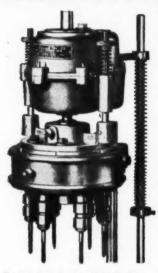
Parts last longer because it produces a super-smooth finish of from 2 to 3 micro inches. It's easy to set up and does not require skilled labor for operation.

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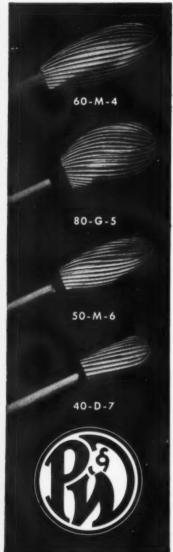
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WEST HARTFORD, CONN.

The 9th Westinghouse Forum

66 T is a genuine tribute to American business and to the great corporation which is our host that such a Forum as this can exist. That representatives of concerns, which in many cases are competing vigorously with each other, can sit down together and swap ideas is in a sense, a vindication of our economic system-proof that the profit motive does engender constructive effort for the benefit of all. That Westinghouse should sponsor such a gathering annually and make it the success which your presence attests is an illustration of that enlightened selfishness which seems to flourish in the American industrial atmosphere and comes to full flower in such a field as that of pure research, the benefits of which are made available to all and sundry. We should cherish these things, gentlemen. They do not happen everywhere, nor do they just happen here. They are one of the characteristics which distinguish the American industrial scene and set it apart from the atmospheres of other countries where intra-industry suspicion and the drawing of the shades about each company's activities is more likely to be the common rule. In America, thank God, we seem to believe that when we part the curtains we let in more light than we let out."

The speaker was Frederick S Blackall, Jr., President, The Taft-Peirce Mfg. Co. His subject was—"Approaching the Machine Tool Problem Realistically." Mr. Blackall told some 600 listeners at the annual dinner, highlighting the Forum, that the machine tool industry is on the threshold of a new adventure. Some have prophesied its doom. While not pessimistic, he believes there is no question but that the industry must exercise its wits to the utmost in the period immediately ahead if it is to avoid the elements of disaster.

He counseled the engineers and administrators present to exert their special gifts to the end of rendering existing machine tools obsolete thru development of new and improved mechanisms which will perform their operations more rapidly and make the products better and cheaper than has ever been the case before. If existing machine tools represent the ultimate product of American ingenuity, then he conceded that we are in dire straits. However, if next month, next year, or upon Victory Day it is possible to announce new milling machines which will outmill any yet conceived, drills which will outdrill, and lathes which will outturn existing equipment, there will be ready markets for all such new products.

Mr. Blackall stressed the obvious fact that all of us must get to work with a will in new ways—that if we are to preserve our industry as we know it, we must first preserve our American traditions. We face an interesting and challenging phase of our economic life in the im-

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ALMOND Three Jaw Drill Chucks are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some form of machine tool such as drill press, lathe, or milling machine. Also used on portable tools, principally electric and pneumatic drills.

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mediate post-war period. What will happen will be determined in large measure by our national policies in the immediate and the intermediate future. Among these none is more vital than the future course of taxation. According to the speaker, our entire tax structure is a hodgepodge of revision and amendment, and there is little doubt that it has reached the point of diminishing returns. What is more serious, it is such an obstacle to the development of new business that it has virtually dried-up the sources of venture capital and has substituted security for risk as the investment objective of aggregations of money, whether large or small.

Actually, labor has far more to lose by unsound tax methods than capital. A few enlightened labor leaders are beginning to recognize their important stake in sound tax procedures, but more of our citizenry must thump for tax revision and do it soon if we are to avoid disaster. It is not a question of tax reduction so much as it is a question of sound application of taxation in ways which will reward rather than penalize risk taking.

The speaker pointed out that next to taxation, the most dangerous threat is the attitude of Government in dealing with labor problems. In due course we must reach something comparable to the Scandinavian System. England already has virtually reached this point of development in labor relations. The right of collective bargaining is unquestionably a proper right, but in those countries the term means just what it says. Both sides have equal rights of organization, expression of opinion, and collective action.

Industry must face its own problems realistically and with some social consciousness. It is doubtful if the swings of the business cycle can ever be eliminated altogether. Undoubtedly they can be ameliorated to a considerable degree, and they must be if we are to avoid national socialism. Industry must make a genuine effort to employ more people and to maintain a more uniform level of employment from period to period.

Mr. Blackall gave other good counsel, and his speech was a stirring feature of the two-day session of the ninth Ma-

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Hole in spindle—Morse Taper
Diameter of spindle at nose
Traverse of head on arm
Traverse of from on column
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Spindle speeds with 1200 RPM motor

Spindle speeds with 1800 RPM motor

Feeds per revolution of spindle

Bearing of arm on column Size of main driving motor Height of drill column over Working Surface of Base Net weight

9" Column 3' Arm

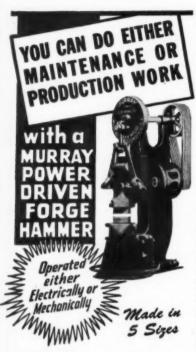
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chine Tool Electrification Forum, May 1 and 2, at the William Penn Hotel, Pittsburgh.

On the first day Colonel Willard T. Chevalier, Publisher of "Business Week", gave an inspiring talk on Future Business Possibilities.

G. A. Caldwell, Manager, General Mill & Resale, Engineering Section, presented New Ideas For Machine Tool Electrification.

Research Advancements in Materials were discussed by Dr. A. A. Bates, Manager, Chemical & Metallurgical Department. The Cause and Control of Surface Damage was the topic of an interesting presentation by E. L. Hemingway, Chief Metallurgist, Foster Division, International Detrola Corporation. Considerable time was devoted to the important subject of Carbide Milling of Steel under the direction of Warner Seely, Sec'y, Warner & Swasey Co. Dr. H. A. Frommelt, Director of Research, Kearney & Trecker Corp., opened this section. He pointed out the steps leading up to the present steel milling operations in considerable detail. Additional opinions bearing on the subject were presented by H. L. Pope, Service Engineering Supervisor, Cincinnati Milling Machine Co., P. M. McKenna, President, Kennametal, Inc., and D. P. Graves, Director of Design, Brown & Sharpe Mfg. Co. E. O. Lowell, General Partner, Grayson Mfg. Co., was unable to attend so his paper was read. There was considerable general discussion of the subject which brought out many interesting and helpful facts. A film "Electronics at Work" reviewed this subject.

Program for the second day opened with an interesting film "Fire Power with a Victory Wallop", showing development of the tank gun stabilizer which permits moving tanks to score a high percentage of hits.

Electrical Requirements of the Machine Tool Industry were discussed by L. W. Scott Alter, President of American Tool Works, supplemented with opinions by G. H. Garcelon, Manager, Control Engineering Section, and W. P. Kelly, Negotiation Supervisor, Westinghouse Motor Division. Control Assembly Factors were reviewed by E. E. Opel, Electrical Engineer, National Automatic Tool &c., Inc., and D. K. Frost, Electrical Engineer, Mat-

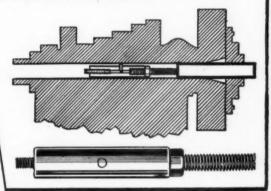
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The Carlson Spindle Lathe Stop is designed to speed up and simplify lathe operation, especially in machining parts on a mass production schedule. When placed at correct position in spindle for first part, it automatically provides permanent set-up for remaining parts to be machined to same dimensions, regardless of quantity. The Stop can be placed anywhere within the spindle. It is fitted with an adjustable screw which can be extended out in center of chuck jaws when chuck is needed for working on small parts.

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- REDUCES REJECTS
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The Carlson Spindle Lather Stop can be installed in a Stop can be when order with the maker when order maker.

Stop can be installed in a Stop can be installed in a stop when order-few minutes. In the stop with the stop with the stop with the spindle.



MODEL No. 101 — Inside diameter %-inch fits South Bend, Logan, Atlas, Sheldon, and other make benchtype lathes. FRICES ON OTHER SIZES FURNISHED ON REQUEST 595

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BROWN READING. PA

tison Machine Works, with observations by E. J. Rivoira, Electrical Engineer, Cincinnati Milling Machine Co., R. N. Clark, Electrical Engineer, Warner & Swasey Co., and J. S. Fulton, Westinghouse Control Section. Simultaneously a general group listened to discussion of Postwar Plans by F. D. Newbury, Westinghouse Vice President, and Expectations of a Machine Tool User by E. L. Spray. Headquarters Mfg. Division, Discussion leader was W. P. Kirk, Vice President and Sales Manager, Niles-Bement-Pond Co., Pratt & Whitney Division, Additional interesting papers were presented by W. I. Bendz, Westinghouse District Engineer, on Theory of the Mot-O-Trol and Electrical Equipment for Machine Tools by G. B. Carson, Research Engineer, Cleveland Automatic Machine Co. Speakers at the get-together luncheon were J. Y. Scott, President, NMTB Ass'n as well as President of Van Norman Machine Tool Co.; also B. W. Clark and A. H. Phelps. Westinghouse Vice Presidents, and C. B. Stainback, Manager, Industrial Department. Westinghouse. Postwar Standards for Electrical Equipment on Machine Tools opened an interesting discussion with Tell Berna, General Manager, NMTB Ass'n presiding. E. J. Rivoira, R. H. Clark, and many others participated. Many had attended the recent joint sessions with General Motors Engineers at Detroit and points raised then were discussed with automotive Engineers present.

Between meetings interesting demonstrations were given of the Vibrometer. Tracer Mechanism and Wide-Speed Range Drive, Tachometer, Focalaire, Tube Oscillator, and Precipitron. Attractive plywood paper-weight souvenirs were bonded together while you waited with a small hydraulic press and high frequency heating equipment. Also included in the exhibit were a Mot-O-trol hookup, new NEMA Motors, and Unit Frame Motor-Generator Set. Some 525 were registered for the Forum, including 380 machine tool executives and about 25 representatives of the technical press. In every way the ninth Forum was a conspicuous success, and a pleasant and profitable time was enjoyed by everybody attending.





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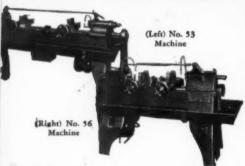
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Cause and Control of Surface Damage

By E. L. HEMINGWAY*

HAVE often speculated upon the reasons for the effect you and I call "friction". What is it that causes resistance when one dry metal surface is moved upon another?

The older view was that projecting roughnesses upon surfaces would interlock and thus have a tendency to restrain movement. It was also believed that serious scoring of surfaces was done by the action of rough peaks serving as dull cutting tools. No doubt such conditions do contribute to drag in movement of surfaces and do result in a certain amount of damage to them. However, I believe the scoring suffered thru simple cutting by roughness has been greatly overestimated. Further, interlocking of projecting surface defects does not explain the resistance to movement found when very smooth and accurate surfaces such as "Jo-blocks" are wrung together.

The modern view is that molecular attraction is responsible for the greater part of metallic friction. When any portions of two metallic surfaces come into close enough contact, they begin to show a tendency toward cohesion. This may be strong enough to be noticeable even tho they be separated by a very thin film of lubricant. If the surfaces are absolutely

clean and come into actual metallic contact, the mutual attraction becomes so intense that the metals are permanently joined together just as in any welding process. Both of the metal bearing members are maintained as rigid and permanent shapes by their internal molecular attractions, and this same force will join two surfaces if they come into contact close enough to be within the field of molecular forces.

No known method of surface finish can produce an accuracy sufficient that more than a small percentage of the total surface can possibly come into such close contact at one time. Nevertheless, this welding action does occur at scattered points whenever dry metal surfaces are rubbed together and too often when they are supposed to be lubricated. Many people (including myself) believe that such welds are being made and broken constantly all over rubbing metal surfaces as their shifting minute high spots come into contact. The energy consumed in their breaking apart is believed responsible for the greater part of friction be-

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tween metals and of the heat developed thereby.

To turn to the practical standpoint, these conclusions make clear the reasons for the most serious kind of damage done to tool and bearing surfaces, which is galling. Galling starts in the described minute spots of welding. When a weld forms, it is almost invariably broken instantly with no perceptible hesitation in the movement of the surfaces, but a fragment of metal will be torn from one to become a ragged defect upon the other. It is these projecting sharp defects that cause more serious damage to tool and bearing surfaces than any other common source of wear.

As soon as formed, their tendency is to plough thru the surface from which they were torn. They seem to disappear rather rapidly in most cases but their common result is the formation of grooves in the direction of movement. I have examined many test shaft bearings under the microscope and have seen very deep scores that seem to have formed in comparatively few revolutions because the shape and width of the grooves varied around the shaft circumferences. In other cases, I have seen marks where the fragment rolled over and over with the rotation. Occasionally one can find the actual fragment that caused the damage. I believe that all of us have seen shaft bearings or piercing punches, for example, covered with deep parallel scratches. Unless unusual quantities of hard and sharp foreign particles have been present, we can be sure that such defects originated in these minute welds. Too often, weld defects persist in place long enough for sufficient metal to pile up ahead of them to stop shaft rotation or completely ruin tool surfaces.

The probability of the occurrence of welding and the extent of damage done depends almost entirely upon four factors. They are:

1—The kind of lubricant or coolant used on shaft bearing or tool surface, as the case may be.

2—The kinds of metals composing the rubbing surfaces.

3—The softness and ductility of the surfaces.

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4—The comparative roughness and waviness of the surfaces; in other words, their geometry.

Time will not allow much discussion of lubricants and cutting compounds. However. I would like to bring out just one thot in this connection. Keeping in mind that metal surfaces must be wiped absolutely clean for welding to occur, we should think of these fluids, not only as lubricants and coolants, but as contaminants as well. If we can maintain the smallest trace of any kind of non-metallic film between metal surfaces, they are unclean from a welding viewpoint. Obviously, an oil or compound that will spread rapidly and tenaciously adhere to shaft, tool and chip surfaces will contaminate them most completely. Addition of chemically active substances to the fluid will often form non-metallic surface films such as chlorides, sulphides or phosphates that prevent welding. The so-called "polar" compounded oils have greater adherence. It seems reasonable to believe that continual improvement in oils and coolants will be forthcoming.

With reference to the kinds of metal rubbing together, some degree of welding affinity exists between all of those commonly used. However, there is considerable variation in that respect. A steel shaft, for instance, welds quite readily to a steel bearing but not so easily to bronze or the more modern silver bearing metal. A steel chip will weld to a high speed tool bit more quickly than a brass chip, and steel cartridge shells give more punch trouble than brass shells. Carbide tool bits weld less readily than high speed because they do not have so true a metallic character. Carbon steels weld more easily than either because they contain still less carbide forming elements and. therefore, have a more truly metallic affinity.

One means of reducing galling that seems to be gaining favor, especially in tool work, is chrome plating. Much of the disappointment experienced in the past with chrome plating has been due to faulty technique, and especially to its deposition on too rough surfaces. Ground and machined surfaces are covered with partially loosened minute metal splinters



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and thus have a more or less porous nature. Plating on such a rough surface cannot be satisfactory and will surely act like a rasp on the mating surface. The result will be vastly different if the surface is made really smooth before plating. Improved results obtained by hard chrome plating are due, not only to its actual hardness, but to its low welding affinity for other metals. I would not be surprised to see it used in the future for a wider variety of tool and machine parts including shaft bearings.

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The third condition affecting galling damage is the softness and ductility of the surfaces involved. As the individual weld takes place, a minute area of the two surfaces is joined together momentarily. The size of that area will be greater if the surfaces are soft enough (perhaps thru frictional heat) to deform to increased contact. The length and width of the weld will be greater with soft (or hot) surfaces, and it will tend toward a more even quality of weld thruout that area because it will conform more completely to the mating surface. Where a hard surface is concerned, there is little less reason to expect welding, but it cannot deform to a large area of contact, and even that small contact will be spotty instead of continuous.

Welds have another dimension in addition to width and length. The third dimension is the depth to which they are torn out as rotation breaks them loose. That depth depends upon the ductility of the torn metal. If that metal is exceedingly hard and has very little ductility. it will flake off in thin particles. If it has considerable ductility, it will tear out to a correspondingly greater depth. Soft and ductile metals not only tend to weld over a larger area but to tear out to a greater depth, as compared to hard metals.

It is not difficult to visualize the difference in damage done by the large weld defect torn from a ductile surface and the small, thin one from a hard surface. We know from experience that a soft steel shaft does not run satisfactorily in a bronze bearing, but a hard shaft does. The reason is that deeper particles are torn from the soft shaft which, in turn, score it to greater depth. The thin flakes



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torn from a hard shaft can scratch it, but metal cannot pile up ahead of them to any appreciable extent because of its solintery nature.

All of us are familiar with the fact that a high speed cutting tool of 64 Rockwell C is usually satisfactory but that one only a few points lower in the hardness-scale, craters too rapidly. I believe that measurable ductility in such tools begins to appear just below 64 Rockwell, and that the welding between the tool face and the chip results in increasing damage as the ductility increases with lowered hardness. Larger particles are torn out of the tool face or cutting edge by each weld as it breaks loose. This same line of reasoning applies to every kind of steel tool used for metal working.

On hardened and ground surfaces, either machine or tool parts, a most important factor is the annealing due to grinding heat. The depth of this alteration in heat treatment varies considerably with the skill of the grinder operator, but the ductility is lowered to some extent in all cases with a corresponding increase in surface damage.

The fourth and last condition affecting the probability of welding is the geometry of surface. Many of us think of ground shaft surfaces as being true cylindrical shapes, for example, yet this is very seldom the case. I have examined the surfaces of several thousand bearings sent to us for suggestions as to improvement. Very few, indeed, did not show some form of chatter, feed marks, flats, etc. In addition, grinder ridges were always present.

Since waviness does exist, it is obvious, on first operation of the tool or bearing, that the load must be carried on a very few grinding ridges on the peaks of the highest waviness. Under such conditions, any real pressure is sure to result in true metal-to-metal contact and welding. The first weld will naturally be limited in size but it will plough thru the length of one grinder ridge, removing part of its content of metal, and tending to flatten it. This process continues until the highest ridges are worn down sufficiently that others beside them come into effect and are subjected to the same action.

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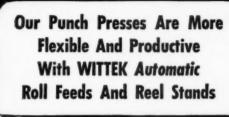
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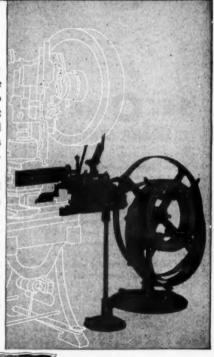
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Particularly in the case of very hard shafts, this galling wear eventually may result in sufficiently improved geometry of surface that wear slows-up to a reasonably satisfactory condition. Many combinations of metals may never arrive at that condition. They may continue galling wear to intolerable clearance dimensions and surface roughness, or may pick up an unusually large weld and freeze.

Recently we have been experimenting with a combination of an untreated .35 carbon steel shaft of Rockwell C 16 hardness and a bearing of 80% copper, 10% tin and 10% lead. These metals were chosen because it was known that they operate fairly well under low pressure, but gall seriously with heavy loads and thus should yield a wide variety of results. The intention in this case was to determine the effects of surface patterns and geometrical inaccuracies. We wanted to know whether there was any important difference in the progress of galling on a ridge running in the direction of motion and on one running across that direction of motion. We also wanted to know whether anything really practical was to be gained by greater attention to perfection in surface shape.

Most of our work to date has been to compare the performance of ground and superfinished shaft surfaces. The ground pattern is, of course, a helix composed of a succession of ridges several times as long as their width and running in almost the exact direction of the rotation. The superfinish pattern varies from almost none, because of nearly perfect smoothness, to any desired coarseness of cross-hatched scratches across the direction of rotation. Each comparison between ground and superfinished surfaces was made using a pair of shafts with very close to the same scratch depth as measured by the Profilometer. Temperature was measured by a potentiometer and a very small thermocouple inserted in a hole in the bearing bushing 1/32" from the rubbing surfaces. Oil was supplied by gravity at a measured rate. Surfaces varying in roughness from 5 to 70 micro-inches have been compared.

While considerable work remains to be done before quantitive results can be released, we have come to certain definite

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conclusions. Both heating and torque were shown to have a direct relationship with the severity of galling. Well distributed small galling actions do not cause serious temperature rise, but one or two large ones cause it to rise 400 or 500°. Since very rough surfaces tend toward more extended galling, they always run hotter than fine surfaces. The metals tested, gall so readily that the load carrying capacity of very rough surfaces (particularly ground ones) was hard to determine because of their rapid heating but it certainly is very low. Practically, they have no good feature except that they will run hotter before seizing. Rough superfinished surfaces outperform ground ones considerably, apparently because that process removes waviness and thus distributes the galling action over a greater number of ridges.

Another factor is that a cross-hatched pattern was definitely shown to restrict the severity of galling. Examination of tested shafts under the microscope showed that scratches extending across the direction of rotation interrupt a galling action, whereas the grinding ridge allows it a more continuous path within which to pile up metal. Additional evidence in that respect was gained by loading a shaft to 3000 pounds psi and rotating it somewhat less than one turn by hand. Actual transferred weld particles and their paths were then plainly visible. Another important discovery was that glazing of the shaft will develop much faster on a cross-hatched surface. A glaze results from the ironing down of very small surface irregularities and proceeds much more readily upon a finely broken-up pattern than on one of greater length, such as grinding ridges.

The results obtained with both shaft and bearing finished to a perfection in dimension and geometrical shape of around a tenth of a tenth were found amazing as compared to ordinary commercial finish and accuracy. One such assembly, for example, with a shaft having a cross-hatched surface of 10 micro-inches, carried 2400 lbs. psi at 1730 rpm with only 80° temperature rise over a test period of nine hours. Under the same test conditions, but with commercial finish, a soft steel shaft running against bronze will usually fail at approximately 500 pounds pressure and with five times that temperature rise. The importance of geometrical accuracy, together with the proper clearance dimension, is not likely to be overestimated.

The profilometer reading of tool and bearing surfaces naturally should vary somewhat with the kinds of metals employed, with lubricants and methods of their application, with pressures and speeds, and all other operating conditions. A hard steel shaft running against bronze: and most metal working tools should be as smooth as possible. Yet the origin of damage is the same on all cases. If we recognize that galling is the most damaging kind of wear-that the usual commercial surfaces are too imperfect in geometry and often higher in ductility than we suppose because of grinding heat -if we make an effort to correct these conditions, then we can expect considerably better service from our tools and bearings.

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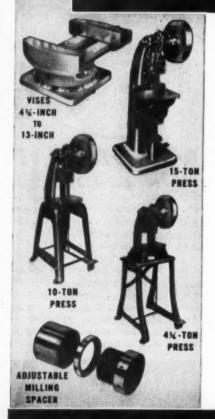
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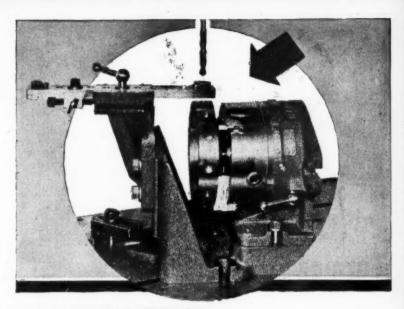
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By CHARLES D. BRIGGS, B.S., E.E.*

DURING the last half century many improvements have been developed in magnetic chucks; not in the fundamental magnetic phenomenon, but in the utilization of this force.

The last decade has witnessed a growing demand for permanent chucks. These chucks were not to replace the electro magnetic chucks but were to supplement them. If a permanent magnet chuck were to be built, it must conform to the principles and employ the same characteristics as the electro magnetic chucks. Therefore, the motivating policy was to incorporate into the permanent magnet chuck, the experiences learned in the manufacture of the electro magnetic chucks.

From the principles of chuck design, three logical, broad facts can be stated. The finished magnetic device can be broken down into three components, namely: 1—The magnetic "battery" which is the source of the magneto motive force.

2—The utilization of this force, which is the ways and means of distributing it for practical use.

3—The adaptability of this force, which is the solving of different problems by the use of auxiliary equipment.

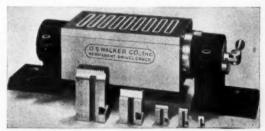
It is evident therefore, that if number one can be created by the use of permanent magnets as well as electrically, the other two conditions could be built upon that foundation and employ all the other magnetic features. This has been accomplished. The permanent chuck has been developed with magnetic top plates of the same design and same pole divisions as the electro magnetic chucks. The use of auxiliary plates for special work can be applied to the permanent magnet chuck.

Undoubtedly, the most perplexing problem of interchangeability between the electric and permanent magnet chucks was to reproduce the swivel type. The basic function of demagnetization of the permanent magnet chuck is to have a movable magnet capable of 180° displacement so that effective polarities can be either added or subtracted. The magnetic flux must have a fixed motion and the chuck, as a complete unit, must have another; yet these two rotary motions must be independent of each other. No complicated mechanism can be used, no interlocking devices to impede the free motion can be employed, and finally the actions must be positive.

At present the "408" permanent magnet chuck has been made in a swivel type

*Chief Engineer-O. S. Walker Co., Inc., Worcester, Mass.

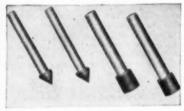
A typical swivel-mounted permanent magnet chuck, especially useful in toolroom applications, and other precision jobs such as the grinding of chasers.



especially for tool room application. Larger sizes are developed with the "410" becoming a standard for this type of work. The same fundamental principle now applies to the duplex and taper base permanent magnet chucks.

In other words, the policy which was first stated as a logical fact has developed into a practical engineering application.

DIAMOND BURRS



A new line of diamond impregnated burrs and wheels has been developed by Champion Diamond Co., 551 5th Ave., New York, 17, N. Y. These burrs and wheels are made of a mixture of tungsten powder and diamond grit, mixed together and formed. They are especially suitable for use on tungsten steel dies and where it is difficult to work with ordinary burrs. They are very useful for fast deburring, for precision surfacing, and for smoother final finishing. They are available in sizes from \(\frac{1}{2} \) " in diameter.

An attractive new bulletin gives complete information on the Champion line of diamond tools.

INSTRUMENT REPAIRING

An interesting, 32-page bulletin on Construction, Maintenance and Repairing of Aircraft Instruments is announced by Henry Paulson & Co., 37 S. Wabash Ave., Chicago, III. The material is by J. A. Gordon, B. Sc., Eng., and is reprinted from the Horological Journal, London, Eng.

Various types of aviation instruments are described and construction details are revealed in drawings. Fuel and oil pressure gages, speed indicators, thermometers, air speed indicators, fuel contents gauges, altimeters, compasses, gyroscopic instruments, turning indicators, gyropilots and other instruments are included.

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on me"

You'll say the same. You see, many operators try the Por-os-way wheel, get greater production then fail to drive for more. Never stop trying to beat old production marks until you've pushed this wheel to the limit of cut and rate of feed. Write for the Por-os-way booklet with the "prescription" blank. Give Por-os-way a going-over on trial!



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Grinding wheels, just as twist drills, need clearance. Poros-way's structure provides chip clearance naturally.



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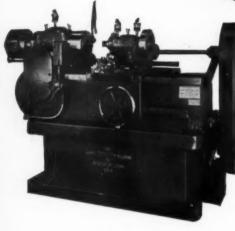
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--INTERNAL OR
EXTERNAL

Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

Set cam-controlled automatic cycle on first piece. Thereafter, cutter feeds into work to proper depth and at correct pitch and withdraws when cut is completed. Work and cutter spindles are driven by individual motors through worm drive, affording ample power throughout the wide range of speeds and feeds.

Write for Details and Specifications.

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MACHINING STEELS ON AUTOMATICS WITH CARBIDE TOOLS

EXPERIENCE has shown that in applying carbide tipped tools to automatic screw machine operations on various grades of carbon and alloy steels, excellent results as to increased production, lowered machining costs and tool life can be obtained by adhering to certain basic rules.

Speeds and feeds

For most efficient operation when using cemented carbide tipped tools in automatic screw machines for steel cutting, cutting speeds must be higher than when HSS tools are employed for identical operations. Too low a cutting speed will shorten tool life and give a dull, ragged finish to the work. Maintaining proper high cutting speed will produce a bright, smooth finish and will also increase tool life.

For turning, boring, and facing with ordinary single point tools on various steels, choice of cutting speed depends mainly on depth of cut, feed, and hardness of the steel. The usual range of speeds is from 200 to 350 sfpm.

Where the character of operations necessitates use of some HSS tools, speeds of spindles equipped with these tools must necessarily be slower than those called for by carbide tools. If these speeds govern the speed of turning, facing, boring, etc., as well, such speeds will sometimes be too low for effective use of carbide tools.

Too fine a feed on rough turning operations increases wear of tool tip and aggravates chip disposal since such chips tend to "ride" the breaker. Heavier feeds give stiffer chips which break more rapidly and can be handled more easily. Where fine feeds are necessary, a grade of Carboloy which has a high degree of wear resistance is recommended.

Form tools require finer feeds to prevent chatter. Feeds from .0025 to .005" per rev. are common, but on some steels, feeds up to .010" are possible. A harder grade of carbide is generally used for form tools to resist the abrasive action caused by the fine feeds. In certain instances, a "straight tungsten" grade of



HYBCO TAP GRINDERS



For Sharpening
CHAMFER - FLUTES - SPIRAL POINTS

Machine Screws to 11/2" hand taps.

Can be arranged for any number of flutes -right or left hand.

ALL TAPS HELD BY SHANK.

Can be sharpened after center is destroyed.

Write for catalog-and send us your problem.

HENRY P. BOGGIS & CO. 1279 W. 3rd St. Cleveland, Ohio carbide will give optimum results with fine feeds.

As with other types of machines, choice of feeds depends upon the type of tool used, rigidity of the work, and nature of the work material. Feeds of .010 to .020" per rev. are commonly used on operations employing ordinary single point tools or roller turner type tools.

Horsepower

Higher hp may be required when retooling an automatic screw machine with
carbides, due to the increased speeds and
greater number of cubic inches of metal
removed per minute. To utilize existing
equipment, feed can be reduced and a
harder grade of carbide used; depth of
cut can be reduced; or the speed can be
cut to the minimum of the carbide tool
range. The fewer of these variables which
have to be changed, the better. Usually,
reconditioning of bearings in spindles and
carrier, etc., will permit machine to be
re-motored for higher output operations
with cemented carbide tipped tools.

Roughing Cuts

Uneven speeds and sudden accelerations during heavy roughing cuts sometimes chip carbide tools. Peak loads responsible for such a condition often can be eliminated by splitting the roughing cut and picking up at another position. In this way, slowing down and quick pick-up of the motor is avoided.

Cut-Off Tools

A cutting-off tool, feeding from the O.D. in towards dead center, may start cutting at the proper speed, but loses cutting speed rapidly as it approaches center. On work pieces having holes drilled in them so the tool doesn't have to cut to dead center-also on certain operations where such extremely high speeds are possible that a carbide cut-off tool can be run successfully in to dead center, little trouble is experienced with carbides. Frequently, however, when such an operation is performed in the conventional manner on a solid steel part with a carbide tool, a built-up edge may be formed on the edge of the tool causing pressure, dulling, and flaking of the tip's cutting edge.

In some cases where it is desired to base cutting speeds on carbide rather than

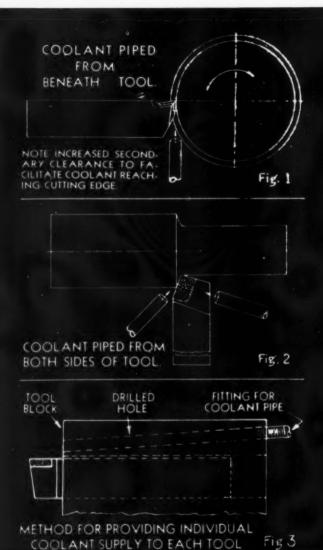
ARMOR COLLET CHUCK





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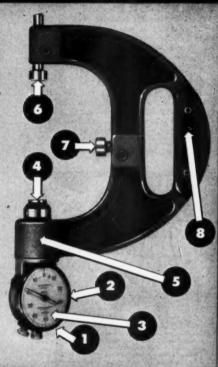
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SHEFFIELD SNAP GAGE

FOR INSPECTION AND CLASSIFICATION

- 1 Gage may be used with dial either at the bottom or the top, whichever is more convenient.
- 2 Dial is adjustable radially and can be swung through 360° to facilitate reading.
- 3 Scale has a range of .005"—each graduation .0001".
- 4 Movable anvil is spring urged for sonstant gaging pressure, but spring has no effect an indicator. Special spring pressures available.
- 5 Movable anvil bearing is long enough to preserve alignment with the fixed anvil.
- 6 Fixed unvil is adjustable to a meximum of one inch.
- 7 Adjustable backstop has a cylindrical face for accurate line contact.
- 8 Comfortable handle with plastic grip to insulate gage from heat of inspector's hand.





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Dayton 1. Ohio, W.S.A.

MACHINE TOOLS - GAGES - MEASURING INSTRUMENTS - CONTRACT SERVICES

on HSS tools, a Carboloy cut-off tool can he used to start the cut and an HSS tool to complete the cut. This technique is predicated, of course, on there being a position available on the machine.

Weight and length of piece being cut off must also be given consideration as the "whip" and "drop" may tend to cramp a tool and break its tip. If the piece being cut off has a hole, and if a position is available, a horn or arm can be fed into the hole to prevent whip and drop. A knock-off must be provided on return of turret or carrier spindle. If the workpiece has no hole, a Vee guide or a hole larger than the workpiece can be fed under or over the overhanging piece to steady it and prevent cramping.

Rake Angle

For most types of steels cut by screw machine tools, the rake angle in direction of the feed should be between 4° and 8° on chip breaker surface to maintain maximum cutting edge strength and also to obtain free cutting action and good finish. Rake angles up to 10° and 15° on the



LITTELL Air-Blast Valve automatically ejects LITIELL AIT-oast voire automatically ejects pieces from punch presses. Keeps operator's hand out of danger zone. Increases safety and speed. Air nozzla guichly adjustable.

Other Littell safety devices include Pres-Vac Safety Feeders for picking up and feeding flat-aurisced materials; also, air-operated Mechanical

Pickers for feeding pieces that vacuum lift will not pick up.

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RAVENSWOOD AVE

chip breaker surface may be necessary for certain low carbon, nickel alloy, stainless, Nitralloy, and high speed steels where chips are sluggish or gummy.

Tool Grinding

Properly ground chip breakers on carbide tools control the dangerous "ribbon" chips which tend to tangle around the tool, tool block, and work piece, by breaking the chip into "crescents" or by producing a "continuous coil". Chip curlers should be ground at an angle which will deflect the chip and cause it to clear the tool holder or block. A chip breaker should be ground at an angle to the side cutting edge to deflect the chip against the upturned shoulder of the work and break it into a "crescent"

Coolant

The higher cutting speeds available with carbides makes cooling quality a prime requisite of the cutting fluid. Straight cutting oils are not usually recommended mainly because they tend to temperrather than quench-the hot metal chip. making the chip springy and difficult to control. "Soft soap" base solubles help prevent rust in addition to cooling the work satisfactorily.

Usually, an increased flow of coolant is required when Carboloy type carbide tools are used. Cutting fluid should be supplied thru pipes at least %" in diameter. The tank should be large enough to keep the coolant temperature from rising too high. Coolant flow must be uniform and directed upon the cutting edge and point of the tool.

Coolant can be directed in a vertical jet from the bottom so it flows up to the cutting edge (Fig. 1). It can be directed from the side horizontally so it flows on top of the tool tip as in Fig. 2. Or the coolant jet can be run from the back of the tool parallel to the top of the tool as in Fig. 3.

Chatter

If carbide tools begin to chatter, these potential causes should be investigated:too light tool section; feed to fine; too large a nose radius; tools improperly ground: excessive tool overhang; tool too dull; improper support of work.

By Carl W. Blade, Engineer Carboloy Co., Inc., Detroit.

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- which casts a definite shadow-line upon the material to be sawed, showing the exact path of the saw before the cut is made. Sawvers speed production of accurate, choice cuttings, well-selected to avoid flaw-scrap and spoilage.

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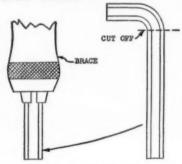
WELDING BOILER NOZZLE



Welder number 194 puts his "best foot forward" illustrating an up-to-date method of boiler-making by fusing a nozzle on a new high-pressure boiler for TVA hydroelectric system. This is one phase of arc welded power plant construction as produced at Chattanooga shops of Combustion Engineering Co.

(Official OWI Photo-Courtesy The Lincoln Electric Co., Cleveland, Ohio)

SPEED WRENCH



Increased speed in driving hollow head cap screws can be attained if the hexagonal cap screw wrench is held in an ordinary auger brace. To do this it is necessary to cut the short arm off the wrench as shown.

By RONALD EYRICH

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For scribing cylindrical and circular parts that do not have a center section.



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benchmaster—the name for quality bench machine tools—now offers its small, accurate

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Table diameter—6" • Worm Gear Ratio—60 to 1 • Bevel Dial Graduated in 1/10 of a degree • Table Graduated, 360° • Center Hole—%" • "T" Slots—36" × %" • Two crossing at 90°, forming two quadrants • Height—2½" Weight—14½ lbs.

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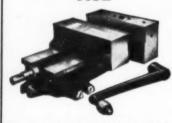
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To-make radial scratch gage.

The tool consists of a flat plate with two guide pins underneath and a center piece, the top of which holds a slide arm. The scriber, at the end of the side arm, can be adjusted for height. The gage will scribe a circle from a machined inner or outer diameter. A temporary center, necessary in the conventional method of laying out such parts, is unnecessary with this tool.

CARBIDE TOOLS RELEASE MACHINES

Elimination of one milling machine and two grinders from an operation on urgently needed naval ordnance parts, as well as the speeding up of production, was recently accomplished at a U. S. Naval Ordnance plant by simply changing to Carboloy cemented carbide tipped cutters in the "rough" milling operation. Not only was a sufficiently fine finish obtained in this one milling operation, but cutting time was actually reduced on the machine.

The operation involved the milling of two sides of a breech casing made from SAE 4320 steel.

In re-tooling the machines, 5" diameter milling cutters having 10 blades each,

PRODUCTION LATHES

NOTE: Special stationary air cylinder and full 21/4" bar capacity through spindle. Designed for speeds up to 1500 R.P.M.

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tipped with Carboloy steel cutting grade 78 cemented carbide, were used. Optimum machining conditions were obtained at 650 SFPM with a 7½" per minute table travel. The cut taken is 9" long and 0.125" deep. Machining time with this setup was only two minutes for each side. Average life per grind with the carbide cutters also rose to 40 pieces, as against 25 pieces for the formerly used high speed steel "roughing" cutters.

BROACHING SLOT OPENINGS



Broaching the narrow openings of the slots in the stator cores of small precisionbuilt motors to remove burrs and small irregularities in stacking is considered

MAGNA-SINE Usefulness



It has been proved many times that, once the advantages of the Magna-Sine have been seen in a plant, this modern method of securing angular grinding set-ups becomes standard shop practice . . . and as many Magna-Sines as can be practically used are purchased. Here are typical examples of how leading companies* have added Magna-Sines to their grinding equipment to get greatest efficiency and accuracy in both single and compound angle set-ups:

 Company A... purchased their first Magna-Sine January 16, 1937... now have 57 in regular use.

 Company B . . . purchased their first Magna-Sine October 5, 1936 . . . now have 41 in regular use.

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Check the grinders on which you can use additional Magna-Sines. If you want complete information and prices on the size and type of units best suited to your production, see your nearest Robbins representative, or write us direct.

*Names of companies will be supplied upon request.

ROBBINS ENGINEERING COMPANY

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For setting up work, tools and fixtures on Boring Mills, Planers and Grinders. For aligning tools or work on milling machines. For lining up drilling operations on drill press. Regularly used in conjunction with Bench and Surface Plates.

Dimensions	Net Price Each
2"x 2"x 2"	3.00
3"x 3"x 3"	4.00
4"x 4"x 4"	4.75
5"x 5"x 5"	9.25
6"x 6"x 6"	12.25
8"x 8"x 8"	19.25
8"x10"x12"	28.00
12"x12"x12"	39.50

SURFACE PLATES

Ground Accurate To .002" From Flat

For laying out work on the bench, mounting bench latthes, assembling and inspection departments or providing a flat working surface.

Dim	en	sions	Net	Price	Each
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12"	×	18"		*********	22.00

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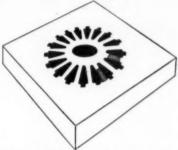
Please Send for Our Catalogue on Complete Machine Shop Supplies.

SID TOOL CO. 183 Grand Street NEW YORK 13, N. Y. the most effective method for doing the job at General Electric. C. W. Flanagan, an assistant general foreman at one of the Company's plants, developed the method. It offers definite advantages over others tried. Filing, for example, tends to pen up the end sections of the slots and does not clean up the center sections.

A broaching tool with a lead and one set of cutting teeth is started in the core by hand. Tool and stator are then placed in a holding fixture with a cap for each end which fits tight to prevent flaring of the end punchings. A small power broach is used to force the tool completely thru the core, letting it fall into a padded receptacle to prevent breakage. The broaching tool is "floating" with respect to the ram of the broach because of the "skew" or angular pitch of the slots.

Cores worked in this manner are suitable for winding with the finest wire, either by hand or mechanically. Also, width of openings can be held to proper size and maintained thruout their entire length. Not only is a better quality obtained, but cost is considerably less, and time required for broaching is about 1/5 the filing time.

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A blanking die in the plant of the New Monarch Machine & Stamping Co., broke in the press during a punching operation. A new die would have taken three weeks to make at a cost of approximately \$200.00. The foreman of the plant asked about the possibility of repairing the break by arc welding and it was decided to try it out on this tool steel die.

Taking the die apart, we V'ed out the breaks and placed the die in the oven at 300 F., at the same time placing in the oven a piece of cast iron block. After both were thoroly heated we took them



AN ideal tool room wheel, engineered specifically for unusually fast stock removal and extremely fine finishing of hard, high speed tool steels.

An open structure wheel, the MID-WEST SUPER-CUT is made with an acclusive MID-WEST developed abrais we that assures an even spread of grain, prevents "hard spots" and guarantees an absolutely uniform grade.

MID-WEST SUPER-CUT wheels are manufactured in two distinct types—red and white—and with a range of grain and grade sufficient to handle any high speed steel tool operation.

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Detroit 11, Mich. Gentlemen:

Please send me additional details about MID-WEST SUPER-CUT high speed steel grinding wheels.

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City _____



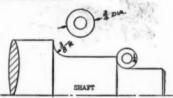


out and, placing the die on the block so it would not cool too rapidly, we proceeded to weld the breaks with a ½" tool steel electrode with the welder set at 100 amperes. We would weld a small bead at a time, peening each weld thoroly as we went along until the break had been filled. We then placed the die back in the oven and draw dipped in oil to harden. After grinding and placing back in the press, the entire repair bill had cost \$10.00.

Our repaired die is still in operation and has since turned out over 500,000 steel and 300,000 fibre stampings.

By Pete Marose, Des Moines, Iowa— Drawing and Data, Courtesy The Hobart Brothers Co.

RADIUS GAGES



A machinist, unable to purchase a set of radius gages, made a set out of plain washers. Washers of various sizes were used, and the outside diameters were turned to the exact sizes desired.

To gage a radius, the washer having twice the diameter of the required radius is used. That is a ¾" O.D. washer would be used to gage a ¾" radius. Or the radius might be stamped on the washer.

By RONALD EYRICH

TUBING STRAIGHTENER

A device which eliminates a time-consuming operation — straightening rolled steel tubing—has been devised by two employees at the Grove City, Pa., plant of The Cooper-Bessemer Corp., Mount Vernon, Ohio.

Typical of many practical ideas that have been conceived and put into use to increase efficiency in engine-building for this 111-year old company, the tube straightener is one of the simplest. Made of a few odds and ends of metal and a series of five rollers, the device eliminates former hand straightening operations.

The tubing, of ¼ and 5/16" diameter, is received in large coils and previously had to be unwound as needed, straightened with a paddle, then bent and formed to fit a specific connection.

PUMPS



VALVES

TO SPEED COOLANTS

Innumerable adaptations prove the flexibility of Fulflo Pumps...variable installations demonstrate the many ways in which these pumps do the trick.





FULFLO CENTRIFUGAL PUMPS

Many types for almost any kind of coolant pumping. Motor, direct or belt driven. Special types developed for special purposes. Pipe sizes %" to 1½ inch.

Illustrated is Model FVM, vertical type.

BY-PASS, OIL-RELIEF VALVES

Non-chattering. Standard or flanged. Cast iron or brass bodies, brass, hardened or stainless steel pistons.



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Specialties Co., Inc.

SUPREME Brand Hard Edge Flexible Back Metal Cutting BAND SAWS



Have you been bothered with frequent band saw blade breakage, soft cutting edges, uneven set, or lack of proper temper?

If so, put on end to such trouble by using SUPREME METAL CUT-TING BAND SAW BLADES.

Available in continuous bands for any machine or in coil form for radius or pattern cutting machines. All sizes permitted by WPB. When ordered in 100' lengths, coils are packed in handy containers.

Send for complete illustrated folder.

The Saw & Knife Specialty Co., Inc. 6523 Carnegie Ave., Cleveland 3, Ohio



The coil is simply positioned over a bracket at the side of the contrivance. The loose end is threaded thru the rollers and the tubing is straightened by pulling it out along a horizontal tray where it is measured and cut off to the required lengths.

"SHOOTING" QUARTZ FILAMENTS

JOHN'S DRILL

For Tapping Machines

These jigs are now provided with universal jaws which permit quick setup for end drilling and topping.

The reversible V plates will accommodate a large range of diameters.

WRITE FOR DETAILS.



HEUSER MFG. CO.

1638 N. Paulina St.,

Chicago, III.



The cross-bow, storied weapon of medieval times, is serving Westinghouse research engineers to draw out delicate quartz filaments that are used to measure the magnifying power of one of the



MICRO-JURN HREAD

A lathe attachment consisting of a combination tool holder and follow rest. Consolidated in one piece, the MICRO-TURNTHREAD can easily be installed in the tool post of any lathe. Incorporating such features as: Quick retractibility of tool, used at the beginning and end of threading cuts. . . Cross movement for cut off and forming. . . . Quick change of tools without disturbing set ups.

The MICRO-TURNTHREAD is designed to simplify long, small-diameter shaft work . . to take short runs of collars, studs, bushings, etc., out of the nuisance class, and into profitable business. The MICRO-TURN-THREAD performs these operations on old antique lathes, which ordinarily would be considered useless. An outstanding development in lathe attachments . . a demonstration will convince you . . write today for descriptive folder.

MANUFACTURED AND DISTRIBUTED BY

BLANK AND BUXTON MACHINERY COMPANY

3100 E. MICHIGAN AVE.

JACKSON, MICH.

most modern of scientific instruments, the electron microscope.

To make the filaments, Dr. Alois Langer of the Westinghouse Research Laboratories, places the bow in firing position and attaches the arrow to a small, cylindrical piece of quartz. Using the hot flame of an oxy-hydrogen torch, he heats the quartz until it is just about to melt, then pulls the trigger. The arrow darts from the bow at high speed, drawing out quartz filaments so fine that it would take 60 of them to equal the thickness of a human hair. The filaments—1/30,000th



Converts Atlas & Craftsman Engine Lathes into Turret Lathes

The Aero Self-Indexed Bed Turret has six tool stations and six individual stops that index with the turret. Precision finished. Hand-scraped ways. Pre-loaded Timken bearing head.

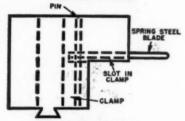
ATLAS AND CRAFTSMEN DEALERS:

Every Atlas and Craftsman owner is a prospect for an Aero Self-Indexing Bed Turret. Write for attractive dealer offer.

KESSLER AERO PRODUCTS CO.
211 West Palm Avenue - Burbank, California

of an inch in diameter—are used as measuring sticks" for the magnifying power of the electron microscope.

CLAMPING KINK



SPRING STEEL BLADE

Spring steel blades of proper size are being used instead of fixture clamping fingers to assure proper tool clearance at the General Electric plant

at the General Electric plant.
Previously, fixture clamping fingers of very small cross-sectional area were used.
Breakage of these hardened pieces caused production delays. Replacement of the fingers with spring steel blades which are placed in slots cut in the main body of the clamp, was suggested by C. R. Haak, a toolmaker. These blades, pinned in place, hold the piece being worked without fear of breakage.

In manufacture of small motor parts, several of the small parts must be clamped to chucks by pry-off slots or similar spots, thus requiring these small fingers. By the use of spring steel inserts on this work, vital toolmaker's time has been saved and machine shut-downs and production loss have been avoided.

MASTER INSPECTION FIXTURE

This master inspection fixture for aircraft engine collector rings at the Amer-



C-master Magnifying Lens

mounted on permanent magnet with adjustable angle device

Models M.L.1, M.L.3 and M.L.4 are specially designed to ald and speed up inspection and assembly of intricate mechanisms. They are powerful, large, handy. Their magnetic base will instantly attach itself to any metallic part of machine and firmly hold the lens at any angle desired.

> Sold by Jeading Mill Suppliers Distributed by Graybar Electric Co.

ULLMAN PRODUCTS CO. BROOKLYN 32, N. Y.





ican Central Mfg. Corp., plant, Connersville, Ind., is duplicated at Consolidated Vultee, prime contractor. It permits quick checking of every dimension of a finished collector ring immediately upon completion and before attachment to the engine, where the ring collects exhaust gases and conducts them to the turbocharger.

The gauges in the background are kept on a convenient rack and used to check section openings—part of the job of "holding stove pipe to tolerances of .005", as one old workman calls it, All this seems

ADJUST-ANGLE KNURL HOLDER





With capacity up to $2\frac{1}{2}$ " work diameter, this Holder adjusts to produce many patterns from straight knurls. Shank to fit your turret.

Request Illustrated Price Circular

GRAHAM MFG. CO.

53 Bridge St. East Greenwich, R. I.

Ideal for polishing, de-burring, lapping small metal and plastic paris.

Ask for Cat. 440

SCHAUER MACHINE Co., 2064 Reading Rd., Cin'ti, 0.



a far cry from the kitchen sinks and other stamping work which American Central produced before the war!

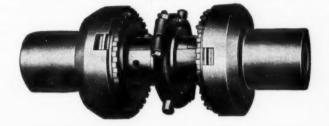
TAP HANDBOOK

The "Threadwell Tap Book," an attractive new 64 page tap manual has been issued by Threadwell Tap & Die Co., Greenfield, Mass. Starting with considerable historical information on the development of taps, a brief explanation of thread forms is given. Then follows some helpful tips on tap nomenclature. Typical members of the Greenfield family are introduced with interesting hints on selection of the proper taps for the jobs.

Some useful engineering tips give advice on tap drill sizes, cutting speeds, and tapping speeds. Constructive information on lubricants is included followed by detailed instructions for sharpening taps. In tabu-



DOUBLE FEATURE



TODAYand TOMORROW

Conway Double- Clutches

TODAY . . . In the war offensives! Tomorrow . . . in peace operations! Conway Clutches steadily perform their time-tried duty of bringing power right to the place you want it.

CONWAY DOUBLE-THROW CLUTCHES are quite remarkable . . . one runs forward while the other runs in reverse . . . or one runs fast while the other idles or runs slow . . . or one runs on machine and the other on brake . . . you use the combination which suits your power needs best.

CONWAY CLUTCHES are compact, self-contained and offer many features to prove their efficiency and economy of operation.

> Patented in U.S.A. and Canada Reasonable deliveries.

THE CONWAY CLUTCH CO. 1541 Queen City Ave., Cincinnati 14, Ohio

MACHINIST'S OPPORTUNITY IN LIQUIDATION OF ESTATE

to add profitable volume to your normal business. 28 year old nationally established business manufacturing specialized line of light machinery for sale. Trade has made money, wants to buy our products when war controls lifted. Only moderate investment required.

Grand Mfg. Co. 1035 W. Lake St. Chicago 7, III. lar form information is given as to procedure in tapping various materials with a handy check list of common causes of trouble.

There are explicit directions for measuring taps and several pages of decimal equivalents. In writing for a copy use your business letter-head.

BUTT WELDING SMALL TOOLS

Altho joining band saws by the butt welding process is not a recent innovation, the use of a butt welder unit in making small tool repairs and extensions is a very recent application.





The Eastern Aircraft Co., Linden, N. J. was one of the first firms to make use of their band saw butt welding equipment for both drill salvage, small tool making, and spot welding. This procedure has proven so extremely fast over former methods that it is now being adopted by industries all over the country.

A series of photographs and step-bystep instructions in this new process is illustrated in the new folder, "The DoAll Butt Welder". Information on other applications for this welder together with the butt welder specifications are included in the folder, which is available from the manufacturers, Continental Machines, Ins., 1301 Washington Ave. So., Minneapolis, 4. Minn.

RESISTANCE WELDING MANUAL

A new 28-page bulletin Number GET-1189 has been issued by the General Electric Co., Schenectady, N. Y., giving a considerable amount of helpful information on resistance welding. Part I discusses the methods and equipment describing all

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

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the most popular types. Part II is devoted to selection of the proper equipment for best welding results. Welding electrodes and their maintenance are covered in part III, while material and its preparation for welding are discussed in part IV. There are a number of illustrations and a lot of excellent hints, tips, and suggestions are embodied.

MACHINE PRODUCTS CATALOG

The Machine Products Corp., 6767 E. McNichols Rd., Detroit, 12, Mich. announce a recent catalog featuring their line of surface plates, angles, parallels,

- . HEAVIER CUTTING SPINDLE
- FOUR SPINDLE SPEEDS
 MORE PANTOGRAPH REDUCTIONS
 FORMING GUIDE ATTACHMENT

Plus the exclusive Panto feature . . . Interchangeable heads for engraving, electrical marking, and acid etching.

Write for new Catalog

H. P. PREIS ENGRAVING MACH. CO. 157A SUMMIT ST., NEWARK 4, N. J. vee blocks, straight edges, cylinder squares, and Rotabs. Briefly, the bulletin discusses the need for greater precision and improved efficiency in production, lay-out and inspection departments which the company states may be obtained by use of the proper equipment. Copies will be mailed gratis, on request.

DEGREASING MANUAL

The Phillips Mfg. Co., 3492 Touhy Ave., Chicago, manufacturers of cleaning solvents, and degreasing equipment, offer a new complete Manual on Vapor Degreasing.

Anyone concerned with industrial solvents and degreasing in any way—will find this new book a source of much valuable practical information. It is the last word on the rapidly growing field of Vapor Degreasing—an unbiased, factual presentation of the subject. Written by a leading metal-cleaning engineer, in clear, concise question and answer form—this illustrated handbook takes up every phase of vapor degreasing including:—Types of work that can be handled by vapor degreasing, recovery of solvents, toxicity, degreasing of bowl-shaped parts, proper size of degreasers, special uses for degreasers, and many other problems.

PLATING PLASTICS

The new process of metal plating on plastics, glass, etc., developed by Precision Paper Tube Co., has been taken over by Electro Plastic Processes, 2035 West Charleston St., Chicago (54) III.

Installation of special equipment to facilitate production runs is going steadily forward. Operation on a limited basis has been in progress for several months.

been in progress for several months.

Stronger unity of bond between metal and plastic is obtained by the new process. It is claimed to withstand impact, vibration, and extreme temperatures without peeling or blistering, to the limits of the dielectric itself, which is greatly strengthened by the plating.





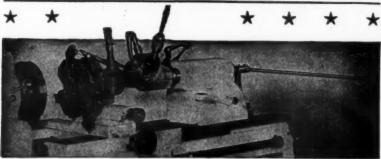


Photo above shows Jefferson Turrets on 16" lathe



71/2" Swivel Base Dividing Head — In Stock IMMEDIATE DELIVERY No Priority Required

Convert YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Yes, it's as easy as that!
You simply attach the
Jefferson Tail-Stock Turret, the Jefferson
Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in
illustration.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times NINE DIFFERENT TOOLS.

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurilling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.



5-Tool Tail-

Stock Turret

PAT. PENDING

4-Tool-Tool-Post Turret



6" Tilting Dividing Head with 3 Indexing Plates and Tailstock— Immediate Delivery.

Some territories still open for dealers and salesmen.

Jefferson Turrets are real production tools— substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

TURRET DELIVERIES IN 6 DAYS

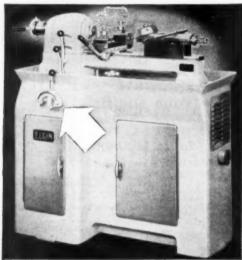
JEFFERSON MACHINE TOOL CO.

Tool-Past Turrets, Tail-Stuck Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratary Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises.

Select

ELGIN

with >



Elgim Precision Hand Screw Machine equipped with Variable Speed Drive, Any speed from 120 to 3780 rpm is quickly available without stopping spindie. I* collet apparity (No. 5C collet) 9" swing.



Elgin Horizontal Bench Milling Machine with Variable Speed Drive: 85 to 2750 rpm: i" toilet rapacity (No. 5C collet), Table 41%" wide x 18"



We can also furnish Elgin Collets in all standard and special types, in any required size for your work.



Elgin Precision Bench Latho with Variable Speed Orive; (20 to 3780 rpm; I" cellet capacity (No. 3C collet); 9" swing and 17" between centers. Sturdy and accurate.

> the VARIABLE SPEED DRIVE



This Variable Speed Drive places at Operator's Fingertips, instant control of any speed in a wide range of rpm (120-3780 and 85-2750).

for Ultra-Precision

In metal-working plants all over the country where small parts for combat equipment are being machined to split-thousandth tolerances — you'll find the most exacting kind of jobs being put on Elgin Precision Machines like these!

Topnotch performance on "rush" war jobs is assured by such established Elgin features as: Perfectly sustained precision when the going is toughest, versatility on an extremely wide variety of work, smooth operation, simplified control . . . and real speed.

And now, to assure Elgin users the ultimate in precision and fast output, another feature has been added: THE VARIABLE SPEED DRIVE. Each of the three Elgin Precision Machines illustrated here is equipped

with a Variable Speed Drive which places at the operator's fingertips any speed in a wide range of RPM (120-3780 and 85-2750). Instantly, without stopping spindles and without shifting belts, the operator can obtain precisely the correct speed for every operation. That means superaccuracy on every operation, from roughing through finishing!

Check the specifications listed herewith in conjunction with the Elgin Precision Hand Screw Machine, the Elgin Horizontal Bench Milling Machine and the Elgin Precision Bench Lathe. Note the Elgin Collets at the left. Then write us for further data on prices and deliveries.

Let Elgin Precision Tools speed your production-for-Victory!

TOOL WORKS 1772 BERTEAU AVENUE CHICAGO 13, ILL.

WHAT'S NEW IN METALWORKING

MONARCH SHAPE-TURNING LATHE

NEW shape-turning lathe which will handle work up to 16" in diameter is announced by Monarch Machine Tool Co., Sidney, Ohio.
This latest "Shape Master" incorporates

further refinements over the model in-troduced just prior to outbreak of the war and almost immediately withdrawn to permit concentration on the all-out production of Monarch standard and toolmakers' lathes for the war program.

Capable of doing the most intricate

shaping and forming work, the new ma-chine makes possible turning, boring or facing in almost any desired shape.

Oval-shaped bottle molds, dies for glass or plastic dishes, and punches or spinning chucks for silverware and hollow ware

of all types can be machined with ease. For example, an oval dish mold with as many as 16 flutes can now be machined completely from rough to finish in only 2¼ hours—a fraction of the time ordinarily required to do such work. Moreover, the original mold can be duplicated exactly—not once or twice—but as many times as needed to put the product involved on a mass production basis.

The "Shape Master" mechanism consists of three elements, One controls the shape cut. Another regulates rate of repetition of the shape of any given circumfer-ence. A third controls the contour gen-erated on successive diameters.

The tool-actuating mechanism, mounted on carriage crossbridge in place of the



SHELDON

"Keeping em Rolling"

Wherever our Armira go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops. These compact truck-mounted machine shops are found wherever the going is toughest for it is their job to keep all mechanized ordinance operating efficiently. It's a big assignment, and we are proud that SHELDON Precision Lathes are selected to handle it.

*SHELDON Lathes are also sandard in the Marine Corps Mobile Shop Trailers and on many Naval



SHELDON MACHINE CO., INC. 4242 N. Knox Ave., Chicago 41, U.S.A. usual compound rest, is cam-operated. A cam follower is linked to movable tool carrier—which rests on anti-friction bearings—and guides tool in a shaper-like stroke, is adjustable from 0 to 2".

The master cam itself records only a single element or unit of the desired design or pattern, whether oval, triangle, square, hexagon, or a non-geometric shape. In the fluted dish mold illustrated, or example, the master record would represent curvature only of a single flute.

represent curvature only of a single flute. Repetition of the shape to be cut is determined by the geared relationship of cam and spindle revolutions. A single motor powers both, and the machine has been provided with sufficient change gears to give a range up to 500 shapes or

tool actuations per revolution of the work. The "Shape Master" further simplifies complicated work of shape generation by making its own master record cams. Provision has been made whereby a simple, motor-driven cutting head can be substituted for the cam follower. Then an enlarged template of the section desired (only a segment is needed in the case of a symmetrical form) is chucked and a stylus or follower is substituted for the tool. Chuck is slowly rotated and the machine "works in reverse" to cut its own cam.

Overall contour of work can be manipulated in two ways. A stroke-compensating device makes it possible to maintain the same shape over a constantly increasing or decreasing diameter of work piece. Irregular contours can be obtained by use of a metal template in conjunction with Keller electrical controls.

Careful engineering of the "Shape Master" has successfully overcome the two principal bugaboos of shape turning—smooth blending of surfaces in the change of sections from round to oval, hexagon to square, etc.,—and the problem of producing sharp, clean-cut corners in recessed or exterior angles. Exact, quantity duplication of molds, punches and dies has become a relatively simple matter and hundreds of combinations and variations of design are now easily created from a single master record cam.

WETMORE REAMER CATALOG

An attractive new 52-page catalog has been issued by Wetmore Reamer Co. 418 W. 27th St., Milwaukee, Wis., covering their complete line of adjustable, inserted blade reamers, boring bars and special tools. It also contains other data and information that is very useful to production executives and tool engineers.

MATTHEW Patented ROTARY TOOL CARRIER

is indispensable for finishing a complete multiple contour or irregular shaped milling job in ONE setting without use of Rotary table.

Capacity up to 7" diameter circle. Will fit any horisontal milling machine or can supply a suitable machine if required. Spindle speeds, standard 600 to 2800 R.P.M.

Rated capacity 1" end mills in steel.

Highly recommended for Metal Pattern, Molds of all kinds, Die Cast Dies, etc.

A quick self liquidating capital investment.

Descriptive matter on request.



PRODUCTION MACHINERY DEVELOPMENT COMPANY

4845 St. Aubin St.,

Detroit 7, Michigan



quick way to Stop Dust?



DUSTKOP
SELF-CONTAINED
DUST COLLECTORS

MODEL 600

DUSTKOPS are installed in a few minutes. Flexible metal hose makes slip fit with dust outlets on grinder.

MODEL 950

This unit, with dust hoods, "ready to go," fits any double-end pedestal grinder not already equipped with wheel guards and dust outlets.

DUST STOPPED ON ALL ABRASIVE OPERATIONS AT LOWEST COST

For quick, economical, effective,dust control at the source, install DUSTKOPS. Easy to attach to surface grinders, disc grinders, cutter and tool grinders, flexible shaft grinders—or to buffers, sanders and abrasivecut-offs—whether single or multiple units. Large or small models available.

DUSTKOPS are compact and portable. Entirely self contained, with motor, fan, cyclone separator (in all but smallest models) and spun glass filter. Flexible metal hose permits quick installation.

DUSTKOPS clean the dustladen air without wasting heat. Efficient cyclone separator provides low maintenance. Many other features make DUST-KOPS ideal for your shop or laboratory. Immediate shipment of "standard" voltage units.



MODEL 950—with cyclone separator means low first cost, low maintenance, even on production surface grinder,

(Left)

MODEL 1250—one unit handles dust from four wheels.



With flat, spun glass filter for compact bench installation. Pulls all dust from two grinder wheels.



MODEL 950—has cyclone separator, plus spun glass filter. For medium duty work of all kinds.



MODEL 1250—gets all dust and smoke from this heavy duty abrasive cut-off, at extremely low cost,



AGET-DETROIT COMPANY

605 First National Building

Ann Arbor, Michigan

Detroit Office: Tol. CAdillac 3090

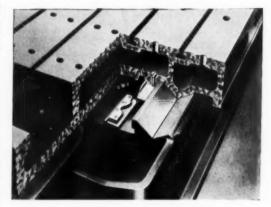
GRAY SAFETY STOP FOR PLANER TABLES

A device for stopping a runaway planer table after it has run off the bull gear, and is therefore out of control, is now a regular feature of planers built by The G. A. Gray Co., Cincinnati, Ohio.

The need for such a braking device in the event drive motor fails to stop and reverse table, has been a apparent for some time but has become more acute due to present-day high speeds. Table speeds are now twice as fast as they were a few years ago, which means that table will travel four times as far before coming to rest. In average shops it is not feasible to allow sufficient clearance for such over-

travel at each end of planer. Consequently a runaway table becomes dangerous

under such conditions.



The Gray Safety Stop Consists of cutting tools bolted to bed at each end, adapted to engage stop blocks bolted to under side of table as shown. Table is brought to rest by the tools cutting into stop block. Tools do not engage the block until table rack has run off bull gear. The tools are arranged so cutting action occurs on side of block, avoiding upward thrust which might otherwise cause table to lift and thereby damage ways.

Many tests have been made on highspeed planers of wide variation in size. In all cases, table traveling at maximum rated speed was quickly brought to rest in a distance varying from a few inches for smaller planers, to not more than a foot for the largest, heaviest machines. The outstanding feature of this safety

The outstanding feature of this safety stop is the unfailing protection it affords even tho it may not be called upon to

WHITNEY- JENSEN PRODUCTS



ROLLER BRAKES

Roller bearings at important points make them faster, easier working. Combination type for box and pan as well as all kinds of straight bending. Made in 4-5-6-8-10 ft. sizes and 12, 14, or 16 ga. capacity.

Write for New Punch and Die Catalog.

WHITNEY METAL TOOL COMPANY



Birect Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 010 4 inch.

FREE LITERATURE and



ALCO TAP HOLDERS

Don't let it be said that you produced too little and too late. Save all the time you can, cut out waste motion and be as efficient in your operations as you know how.



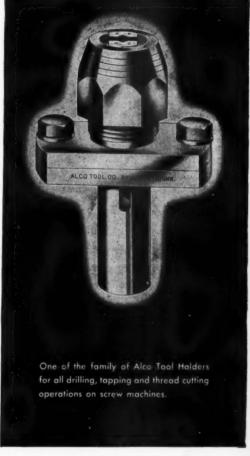
The Alco Tap Holder on your Screw machines will help your set-up man cut corners because this holder RE-QUIRES NO BUSHINGS. The saving in bushing costs alone pays for the tool.



Adjustable floating feature guarantees concentricity of tap with work, insuring perfect threading and increasing tap life. No more broken taps due to misalignment or incorrect tap angle.

Send for catalog showing complete line of Alco Tool Holders.





ALC CFFFD OLS

THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.

Detroit Office: 908 Stephenson Building Chicago Office: 6219 So. Kenwood Ave., Telephone: Hyde Park 6807







function during lifetime of machine.

It is desirable to replace stop block and redress tools after safety stop has operated. Replacement can be bolted on easily without removing table from bed. This patented device can be installed on planers now in service.

PRESS MARKING SHELL CASES



A simple precision marking die made by New Method Steel Stamps, Inc., 147 Jos. Campau St., Detroit, 7, Mich., permits the automatic machine marking in production of parts with a single milled die incorporating all the lettering and figures or designs required.

The particular die shown is employed in a punch press and is used for marking drill cartridge bases for 75 mm shell. The more than 50 figures and letters engraved on the stamping die were cut by the New Method pantographic milling process and later hand finished by engravers.

THYRATRON WELDING CONTROL

A new thyratron welding control for providing precise control of low-capacity spot welders has been announced by the Industrial Control Division of General Electric Co., Schenectady, N. Y. Coupled with a suitable welding transformer, this control can be used with either welding tongs or a small bench welder, and is particularly suitable for spot-welding of vacuum tube parts.

Other applications for which the control, in combination with a proper welding transformer, is desirable include welding of solid or stranded wires to terminals of copper, brass, bronze, steel, or ferrous alloys; joining two tinned-copper, steel, or alloy wires; and spot-welding thin pieces of various alloys.

Bulletin GEA-4175 gives full details.



Whatever your requirement in a Flexible Shaft Machine

The Wyco Line carries a complete range of rugged, dependable units to fit any production need. The Wyco line is on the aircraft and armament front NOW, and doing a civilian production job as well—but for the post war era—for even greater demands—the Wyco line will be geared up for 100% satisfaction in any situation where heavy, medium or light duty production is desired.

Single and Multiple Speed Floor, Bench and Suspension Models, as well as Multiple Speed Jack Shaft and Radial Type Machines, all carrying the Wyco Guarantee for materials and workmanship, are setting records for longer shaft life and greater production.

Send for our New Catalog

WYZENBEEK & STAFF, INC. 838 West Hubbard St., Chicago 22, III.

WYCO Patented Non - Metallic Innerliner.

Makes the Core last longer — Run smoother — Transmit more power.

6 DAYS DELIVERY



THREAD MILLING CUTTERS (HOBS)
EXPANSION- AND RADIAL RELIEVED FORM CUTTERS,
Regular or interrupted tooth form

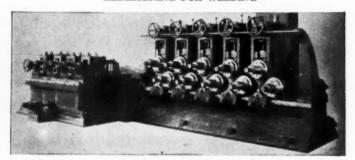
CIRCULAR THREAD CHASERS

INVOLUTE SPUR GEAR CUTTERS-141/2°; 20° & 25° P. A.

Send Blueprints and Specifications

U. S. MACHINE TOOL MFG. CORP.

REDESIGNING FOR WELDING



The redesign of machinery to welded type of construction is a growing trend wherever machinery of any classification is manufactured. This has been a natural course for machine designers to follow as signified by the inherent advantages of welded structures apparent in hundreds of case studies analyzed by welding authorities of The Lincoln Electric Co., Cleveland, Ohio.

A recent instance where welded redesign enabled the builder to obtain all the

benefits of the electric arc process, including a substantial reduction in weight, involved the construction of a special metal straightening machine by Sutton Engineering Co., Pittsburgh, Pa. The unit was built for a large producer of aluminum shapes who had formerly used a similar machine of cast base construction.

The new machine, which is 110 feet in length, weighing about 125 tons, is capable of handling material in lengths of from eight to 50 feet.

The Sensational New Patented, Perforated, Continuous Roll! FIELD FLEXIBLE ABRASIVE WHEELS

Designed for precision work where flexibility is required. Indispensable for sanding and finishing ... penetrating recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic. Used for finishing propellers in aircraft plants. WRITE FOR DESCRIPTIVE BULLETIN AND SAMPLE. Prompt deliv

FIELD ABRASIVE SPECIALTY
MANUFACTURING CO.
203 LOWE BLDG. DAYTON 2, OHIO





Quick service on all Special Die Sets and Bolster Plates from Bridgeport and Detroit.

Complete specifications No. 9 CATALOG.

Producto Die Sets and Accessories can be assembled and shipped quickly from 5 strategic points in the country. For service 'phone the following:

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Makers of PRODUCTO MODERN MACHINE VISES

THE PRODUCTO MACHINE COMPANY

990 HOUSATONIC AVE. BRIDGEPORT, CONN.

DETROIT, MICH.

4-9481

The bed consists of six sections with four by 15-foot top plates of 41/2" thickness; side plates, three by 15 feet and ¾" thick, and bottom plates 3'4" by 15 feet of 1%" thickness. The headstock end of the unit has a smaller cantilever section measuring 11 feet in length.

Integral parts were positioned, tacked and fillet welded with 5/16" electrode of American Welding Society specification E-6012. Single pass technique was used thruout.

In redesigning, no attempt was made to duplicate the former conventional design



All grip—no slip . . no bearings, friction, head or lost power . . push out type . full spindle capacity er over . . automatic adjustment . . work re-set without stopping lothe . . 2 sizes, 17 and 2" capacities . . order now with proper priorities.

Immediate deliveries.

HALL MANUFACTURING COMPANY

622 Tulgrosa Dr. * Ph. NO 9679 * Los Angeles 26, Cal.



VARIABLE SPEED TRANSMISSION

For "A" section V-belts __ 3.3_1 speed range_perfect belt alignment in all positions. Priced so low that no shop or machine need go withoutinfinite speed selec-\$1650 (3 Types-8 sizes to choose from)

Standard Transmission Equipment Co. 3409 VERDUGO ROAD LOS ANGELES, CALIF.

and the finished product was found to be extremely efficient in all its operating functions without the disadvantages of structural weakness, bulk and excess weight.

PURCHASING TOOLS

A safe, convenient purchase plan for forward-looking shop men and home craftsmen who need shop tools but have been unable to obtain them because of priority restrictions, has been announced by Boice-Crane Co., 936 Central Avenue,

Toledo 6, Ohio.

By the Boice-Crane Purchase Priority Plan, machine tools may be obtained at the earliest possible moment and payment arranged out of patriotic savings in

War Bonds.

Manufacturers have been engaged 100% in war production and the pent-up demand for shop tools is tremendous. Prolonged waiting for these tools can be avoided, as can the necessity of buying an unsatisfactory substitute by reserving a preferred delivery position now.

An elaborate booklet describing the plan, together with new literature on the Boice-Crane line of band saws, saw jointers, jig saws, belt sanders, spindle sanders, spindle shapers, drill presses, lathes and thickness planers, will be sent without obligation.

KLING ROTARY SHEARS

An 8-page illustrated Bulletin No. 245 is descriptive of "Kling" Rotary Shears which are available in 6 sizes. These machines will cut or form straight lines, openings, circles, rings, reverse curves, odd shapes, lines, openings, circles, rings, reverse curves, odd shapes, strips, bevels, flanges, joggles and offsets. The largest machine will shear sheets or plates up to 1" in thickness, and each shear will cut any thickness of sheet or plate up to its rated capacity. Address Kling Bros. Engineering Works, 1308 N. Kostner Ave. Chicago 51, Ill.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes. invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. - Inexpensivelast for years.

Write for Circular NIELSEN TOOL & DIE COMPANY 1962 W. Eleven Mile Road, Berkley, Mich.

Here's an outstanding time and money saving tool for your parts numbering operations—the Mercury Interchangeable Type Holder. It provides for fast, accurate and fully legible numbering of metal parts, eliminating errors, rejects and the time

HERE'S ALL YOU DO:

Unlike ordinary one-character dies, which must be used separately, the Mercury holds the entire part number-up to 16 digits, if needed. You simply "load" the tool with the correct part number and snap the cover shut. Thereafter, as many duplicate parts as desired can be quickly and neatly stamped with just a single blow of the hammer for each part! Time normally lost using a separate die for each separate digit is saved, and overlapping, wrong sequence and illegible numbering are eliminated.

The Mercury Type Holder has many more outstanding features you should know about. Type is quickly interchangeable for different part numbers . . . compactness aids in stamping smaller parts ... allsteel machined construction insures long life, cuts replacement needs. Hardened and ground hand-cut steel type is available in a full range of sizes. Full details, including ordering data and specifications for both hand and press style holders, are contained in descriptive bulletin mailed free on request. Write for your copy to-

normally consumed in using single-character dies.



day-ask for Mercury Bulletin 1-B rmediate Delivery

METAL DIE AND 16TH STREET, LOS ANGELES 15, CALIFORNIA

CARTRIDGE CASE FURNACE

An electric salt bath furnace for heat treating cartridge cases, exceptionally large size for its type has recently been completed by Upton Electric Furnace Division, 7450 Melville at Green, Detroit, Mich.

Having a pot size of 21 feet length by 56" in width, with a working depth of 21½", the furnace will be used to full anneal cartridge cases on a continuous production heat treating basis.

Uniform heating of the salt thruout such a large furnace pot is accomplished by correct spacing of a series of sealed electrodes and proper application of electric current. These electrodes, which extend thru from outside of furnace where connection is made to the transformers, are built so that their inside surface is flush with the bricking which forms the interior surface of the walls and floor of the pot itself.

Absence of electrodes extending from above surface of the salt down into the bath eliminates possibility of shorting and burning the work. Moreover, greater efficiency and uniformity of heating is claimed because the electrodes generate heat in the salt at bottom of the furnace



so that a natural, normal circulation of heated salt exists thruout the entire furnace.

Improved Vapor Degreasing



Speeds Up Work 1/3 Absolutely Non-Inflammable

Phillips' PHILLSOLV vapor degreasing solvent is tops for efficiency. It cuts vapor degreasing time by one third! Low toxicity—higher safety factor. PHILLSOLV, non-water soluble, has many applications in instrument and war plants. No corrosive action. Write for catalog on PHILLSOLV and complete line of electrical vapor degreasing machines.

FREE DEGREASING

Contains specific information on degreasing problems, solvents, solvent toxicity and control, solvent recovery, and many practical applications.

SEND FOR COPY TODAY.

on ts, ol-

PHILLIPS Manufacturing Company

3488 W. TOUHY AVE.

BURKE Announces

New DEVELOPMENT that Cuts Bolt Drilling Costs

Recent tests by Army Air Forces Materiel Command showed that cost of drilling A & N engine bolts with this new Burke machine is 50% or less than the drilling costs of other methods. Full details will be sent on request.

This new Burke bolt drilling machine has a normal capacity of 325 drilled bolt heads

This new Burke bolt drilling machine hads a normal capacity of 325 drilled bolt heads per hour. Each bolt is drilled with 8 horizontal holes and one central hole. As operator becomes more experienced, production capacity may be increased. Bolts are placed in an automatic chuck, heads down, and are held rigidly in that position while all seven drills are operating on the head simultaneously. Meanwhile, the operator has ample time to run the vertical drill suspended over the machine, through the holes, thus reaming and burring the drilled holes.

At fingertips of the operator are adjustment screws, controlling depth of horizontal and vertical drilling. Adjustment may be made while machine is in operation.

Drill breakage is reduced materially since spring compensation prevents sudden heads operated machines.

Timing of the drill movements may be changed to accommodate skill of the operator and moved up to the capacity of the drills to remove metal.



Check these Advantages . . .

Normal production capacity of 325 drilled heads per hour, which can be increased with experience.

Operator has time to ream and burn drilled holes.

Fingertip adjustment of screws control depth of drilling. Adjustments may be made while ma-chine is in operation. Spring compensates and prevents chances of drill breakage.

Let us send you full details.

W. B. BURKE & CO. 1609 East 36th St. CLEVELAND 14, OHIO

The molten salt will be held at a temperature of approximately 900° F. Power will be supplied by three phase a-c connected to six transformers which in turn are connected to the six electrodes in the furnace—the transformers being used in pairs rather than singly for greater efficiency of operation.

Offset at far end of furnace is to permit a conveyor to return work thru the bath without lifting it out of the molten salt.

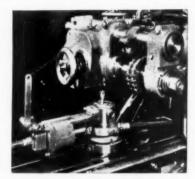
ZAGAR AIR-O FIXTURE

Extensive tests are said to show that this new fixture steps up production from 25 to 50%. Conservatively, therefore, the effect is to make 12 hours the equivalent of at least 15 in point of actual output.

of at least 15 in point of actual output.

The Air-O Fixture retains all the basic advantages of standard Zagar chucking tools:—simple design, rugged construction, long life, no chip trouble, coolant lubricating work and washing chips away and variety of applications without special tooling.

Now, air is employed only to actuate the locking and unlocking mechanism, insuring uniform holding power regardless of variations in air pressure. The fixture is readily tied to the cycle of the machine it is used with, whether milling machine, drill press or automatic ma-



chine, thus making operation completely automatic. Operator's hands are entirely free to load and unload.

Air cylinder is of Meehanite, heat-treated to make a tough, close-grained structure; machined to very close tolerances; interchangeable and adaptable to practically any machine. The simple air cylinder, piston (only moving part) has leather washers, easy to replace. Air is controlled by Senacon valve. Operates on any standard 90-lb pressure air line.



THIS UNIVERSAL PRECISION INDEXING HEAD

can be used on any tool or surface grinder!

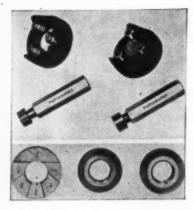
It holds all the tools shown below, and can easily be adapted to hold many others. Graduated 360° in three planes, for every simple or compound angle. Vernier lever will rotate work collet between indexed points without changing index or location of tool in collet. Accurate . . . useful . . . adaptable. Prompt delivery. Write for illustrated circular.



CLEVELAND

TOOL ENGINEERING COMPANY

ANPT GAGES



The rigid specifications set up by the Army and Navy covering Aeronautical pipe threads are fully met by a new line of gages now offered by Pratt & Whitney. Division Niles-Bement-Pond Co., West

Hartford, Conn. These gages will give a rapid, accurate check on pipe threads made to the latest specifications known as Spec. An-GGG-P-363, Amendment No. 2, Symbol ANPT. The new gages are made in a complete line. For checking accuracy of internal threads there is the double-end gage, carrying LI and L3 thread plug gages which check lead, form, diameter and taper. These are followed by a plain taper plug gage which checks taper, roundness and minor diameter. L1 and L3 plugs have three steps for classifying thread, while the plain taper plug has six.

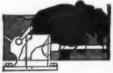
For checking external threads there is a set of two special ANPT Tri-Roll Gages. First is a Tri-Roll Thread Gage which checks lead, form, taper and pitch diameter. Three steps on top of gage classify the thread. Second is a Plain Taper Tri-Roll Gage for checking taper and diameter of threads at crest. This has a stepped plunger and three steps on bottom of gage for easily classifying thread. A setting plug is supplied with each gage.

An alternate method for checking external threads is approved by the Army and Navy. It employs a set of three ring gages. They are L1, or thin thread ring gage, L2, or thick thread ring gage. These

New 1 LAT TOP" WORK HOLDER This new type of air-operated fixture

for holding small flatwork for toolroom use or production operations solves a troublesome problem. Mead "Flat Top" holds any work which is





flat on the bottom, regardless of peripheral contour. Assures "dead true" perpendicularity for drilling, reaming, tapping operations. Completely described in the new Mead Air Power Catalog . . . just out.

SPECIALTIES 15 S. Market Street

Dept. 64-YA

COMPANY Chicago 6, U. S. A

For Smoother Performance



USE ATLANTIC Contour Cutting BAND SAW BLADES

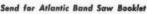
You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear and you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw

securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.





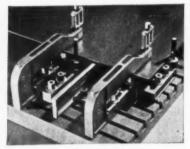
ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively
153 Brewery St., New Haven, Conn.

give the same check as the tri-roll method described, but require more time in use.

The upper composite picture shows a full set of P & W gages for checking internal and external ANPT pipe threads. Gages for the alternate method of checking external threads are shown below.

"BC" PUNCHING UNITS



A new line of versatile "BC" hole punching units has been developed, and is announced by Wales-Strippit Corp., 369 Payne Ave., North Tonawanda, N. Y. These units are designed to punch an unlimited number of straight lined scattered and staggered hole patterns with varying center to center distances. The units may be used interchangeably in press brakes and stamping presses by mounting on T-slotted plates, templates and rails.

After a pattern has been run the same units may be used in another hole-punching pattern.

The units are made up of punches, dies and stripping guide assemblies held together by holders, as independent, self-contained units. The press ram depresses punch thru the material. The punch is full-floating and may be lifted out of stripping guide assembly. The dies are press fit into a holder and may be tapped out thru the slug clearance or with a bent rod.

Various diameters up to 5/16" may be punched by changing punch die and stripping guide assembly.

STEEL BALL MANUFACTURE

"How in the world do you make them 'round'?" is an almost universal question of visitors to New Departure's ball bearing plants.

To answer this suitably, a new booklet has been issued entitled "Making Them



TEST ...

HERMAN
PRECISION GRANITE
SURFACE PLATES

Right In Your Own Plant

OF HERMAN GRANITE
SURFACE PLATES
U. S. Bureau of Standards
General Motors
Chrysler Motors
Ford
General Electric
Westinghouse Electric
Allis-Chalmers
International Harvester
Curtiss-Wright
Crosley Radio
Bendix
Bausch & Lomb
(Write for Comprehensive Re-

port by Well-Known Technieal Laboratory.)

A FEW FAMOUS USERS

Let our representative call with samples of Herman Precision Granite Surface Plates — test them under conditions as they actually exist in your own plant. Then you will see why the roster of companies now using them reads like a page from America's "Who's Who" of distinguished businesses . . because Herman Precision Granite Surface Plates are positively accurate to 1/10,000 inch — cut from granite, they are hard and smooth — non-magnetic, non-porous, non-corrosive. Wherever precision requirements are highest, there you will find Herman Precision Granite Surface Plates. Available in many sizes at reasonable prices. Write or wire today for descriptive folder, technical data, and sample for test in your own plant.

The Herman Stone Co.

1238 Leonhard Street, Dayton 4, Ohio



GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

America's war plants are switching to new, powerful Speedy Air Vises! From a single vise... to an installation of fifty... they are saving time, effort and labor costs! Air operated, foot controlled—both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. \$24

Complete with Foot Control Valve, Air Hose and Fittings, only

DELIVERY 7-10 DAYS! ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT



W. R. BROWN CORP., 5724 ARMITAGE AVE., CHICAGO 39, ILL.

'Round'." By profuse illustrations and clear simple text this subject has been

made plain—and very interesting.

A copy may be had by addressing Advertising Dept., New Departure Div.,
General Motors Corp., Bristol, Conn.

UNIVERSAL FLUTE GRINDER

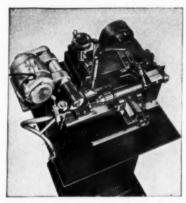
A new 50F automatic Universal Flute Grinder has been developed by the Ward-well Mfg. Co., 3165 Fulton Road, Cleve-land, 9, Ohio. Its main purpose is to grind straight and spiral flutes from the solid in tools such as Taper Pin Reamers (as small as 1/16" in diameter); small counterbores, teeth in side milling cutters, and angular cutters. It will also sharpen saws as small as ½" and up to 8" in diameter and in gangs up to 3¾" long. It can be arranged for other special work on special order.

An interesting feature is the automatic index feed. The machine may be used

for wet or dry grinding.

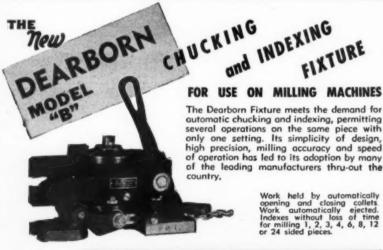
The reciprocating slide is operated by an eccentric adjustable for a stroke up to 5". Eccentric shaft is provided with a clutch which can be disengaged instantly.

The work is automatically fed thru an index plate fastened at the other end of the work arbor.



The standard machine is equipped with a ¾ hp 1800 rpm motor. Quotations will be given on separate grinding units for small diameter wheels.

On special order, a mounted diamond dresser can be supplied. Coolant pump is also supplied as an extra on special



only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the

Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 are 24 rided pieces. or 24 sided pieces.

Write for Folder

DEARBORN

ANSONIA. CONN., U. S. A.



PEER WELDER CATALOG



Manual and automatic Spot Welders made by Pier Equipment Mfg. Co., Benton Harbor, Mich., are illustrated and described in the recently published Catalog 42. Details of important parts, regulator controls and automatic weld timer for controlling the timing periods are given. The foot-operated welders listed range from 5 to 50 KVA capacity; the air-operated press types include 20 to 30 KVA capacities, with high speed projection and spot welders of 30, 50, 75, 100 and 150 KVA capacities. Welding capacity charts for all Welder sizes and for different throat depths are included.

TORPEDO ELECTRIC HOIST

An improved torpedo electric hoist, in 250, 500 and 1000 lb capacities, is offered by the Conco Engineering Works, Mendota, Ill. The features include push button control and double drum construction for balance, and may be had with hook, bolt or trolley suspension. It is equipped with Solenoid electric brake, single pole, paddle type limit switch. The hoist is enclosed in protective housing and has flexible plow steel cable. It is of simple construction, employing only two gear reductions. Gear shafts operate on ball bearings, fully enclosed, operating in a bath of oil.

MARSCHKE SWING FRAME BUFFERS for brushing and buffing sheets, plates and slabs Frequently it takes two men to quide and to keep work-pieces of large area in contact with a fixed wheel of a floor stand type of polishing machine. The cost of such operation is cut in half with a Marschke Swing Frame Buffer. One man, manipulating the machine, also does a better job than two men holding and handling a sheet, plate or slab. The work piece is laid upon a bench or table. The machine is maneuverably suspended from a jib crane and pressure is easily controlled while the wheel is quickly moved over relatively large work areas. Send for Marschke Bulletin No. 47 giving detailed information about six different sizes of Marschke Swing Frame Buffers for economical cleaning and polishing of large areas and heavy work pieces. VONNEGUT MOULDER CORP. 1805 MADISON AVENUE

INDIANAPOLIS 2, IND.

SAVE 3 WAYS!



A smaller maintenance crew can service a larger number of machine tools when Hoffman coolant conditioners are on the job. Hoffman filters continuously deliver waste solids in dry form for easy disposal.



MONEY

Hoffman Model I-18V self-cleaning coolant conditioners effect large savings in maintenance, in coolant replacement, in longer life for machines, cutting tools and grinding wheels, and in fewer rejects.



MINUTES

'Round-the-clock operation becomes a reality. Hoffman filters eliminate shutdowns for sump cleaning, add more productive time to grinding machine operation, frequently permit faster operating speeds.



WITH HOFFMAN 1-18V ... SELF-CLEANING COOLANT CONDITIONER

MODEL 1-12V HAND-OPERATED ALSO AVAILABLE

U.S. HOFFMAN

MACHINERY CORPORATION 215 Lamson St. Syracuse, N. Y.

COOLANT FILTERS . FILTRATION ENGINEERING SERVICE

H. S. STUB & TAPER PIN REAMERS



SIZE			PRICE
.029	LEFT	HAND	2.75 2.75
.0941	99	22	2.13
.1098	99	99	2.75
.1254	99	22	2.75
1410	99	22	2.75
.1566	99	22	2.75
.1723	99	29	2.75
.1879	99	99	2.75
2036	9.9	99	2.75
2192	99	29	2.75
3911	99	99	2.75
.4067	99	99	2.75
4223	99	29	2.75
.4536	99	29	2.75
.4692	99	99	2.75
.4848	99	99	2.75
.5005	99	99	2.75
.5161	99	22	2.75
.5317	**	22	2.75
.6255 .6411	RIGHT	HAND	3.30 3.30
.6567	99	19	3.30
.6723	29	22	3.30
.6880	22	22	3.30
.7036	22	59	3 30
7102	22	2.9	3.30
7348	22	99	3.30
7505	22	24	3.30
7661	22	59	3.30
7817	99	22	3.30
7973	22	99	3.30
813	99	22	3.30
.8287	99	22	3.30
.8443	22	2.9	3.30
8559	22	22	3.30

		-			NO.
				1	
2	//	10	17		7

LIST PRICE EACH

Size	Straight Flute	Helical	
7/0	3.50*	2.75	
6/0	3.50*	2.50	
5/0	3.25*	2.50	
4/0	3.25*	2.50	
3/0	3.25*	2.25	
2/0	3.00	2.25	
0	2.80	2.25	
1	2.90	2.50	
2 3 4 5 6	3.00	2.75	
3	3.00	3.00	
4	3.25	3.50	
5	3.50	3.75	
6	4.25*	4.25	
7	5.25	5.00	
8	6.75*	5.75	
9	8.25*	6.25	
10	9.00*	7.50	

Straight Flute—List less 45% Helical—List less 10%

STUB REAMERS (Continued)

99	99	3.30
99	99	3.30
29	99	3.30
22	22	3.30
99	99	3.30
99	22	3.30
99	99	3.30
99	79	3.30
99	22	3.30
	99 99 99 99 99	19 99 23 99 39 28 98 29 99 99 29 99

In stock . . . Immediate Delivery

*Factory Stock

Write for Our Catalog and Price List

Priorities Must Accompany All Orders

CENTER TOOL Machine Shop Equipment CO. 153 CENTRE STREET, N.Y.

We carry a complete line of H.S. Drills, Milling Cutters, Lathe Tools, H.S. & C.S. Taps & Dies, Drill Chucks, Lathe Chucks, Files, Special Taps & Dies

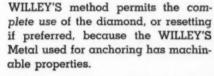
WILLEYS

DIAMOND TOOLS





WILLEY'S Diamond Tools are back again! There's a complete line, with many new improvements!





Setting diamonds in WILLEY'S Metal so greatly prolongs their life that small diamonds will now dress a wheel that formerly required large, expensive stones.

WRITE FOR CATALOG 41

Gives complete information and prices of WILLEY'S Diamond Tools and mechanical dressers. Write today.

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway.

(1) Detroit, Michigan

200-TON HYDRAULIC PRESS

This press is one of many varieties of hydraulic and mechanical presses made available by the E. W. Bliss Co., for the compression of powdered metal. It is shown making a magnet pole out of iron powder. It has been in constant use for a number of years on this and other powders.

The press is provided with a fully automatic cycle with quick advance to work, changing speed before contact with work. pressing, return, ejection and return of

ejector.

Pressure and speed are adjustable over a wide range, making press available for different types of work with accurate pressure control at all times.

Similar presses are available in capacities to 5000 tons, not only in this model, but in a duplex model permitting pressing of deep molds from both ends which secures uniform density and then using the lower slide as ejector. These presses are available with or without a center core rod. The duplex presses have independent speed, pressure and stroke control on each slide making them available for a wide variety of flanged work.

Special presses of multi-slide construction for special shapes such as wide flanged or webbed bushings are also available



with independent pressure, stroke and speed control as well as timing of dwell for each of the several slides.



Why Is Spring-Testing More Important Today Than Ever Before?

If your product is one whose perfect functioning depends upon springs, spring testing is more important today than ever before - especially if the critical situation in metals has necessitated a change in your spring-wire analysis.

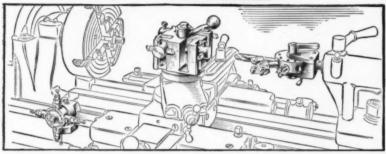
LINK Spring Testers

For speedy and accurate testing of springs compression, tension and torsion - LINK Spring Testers are the answer to your problem. Handoperated instruments for service, laboratory and inspection. Also motor-driven instruments for production testing.

LINK ENGINEERING CO. 13843 Elmira, Detroit, Mich.

Write for Circular 107

Yes, in minutes ...



YOUR ENGINE LATHE IS CONVERTED INTO A PRECISION TURRET LATHE—WITH THESE 3 SPECIALTIES DEVICES

Specialties Cross-Slide Turret — No. 30 for 9" to 12" lathes; No. 60 for 13" to 20" lathes. Gives you four working positions without tool changes . . . allows multiple machining operations on one lathe. Easy to operate—merely flip the turret from one position to another.

Specialties Tail-Stock Turret — No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse

Taper Shank. Quickly converts engine lathe into 4-way turret lathe for end work. You can perform four different operations with the four positions.

Specialties Lathe Stop—No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes. For multiple operations—eliminates repeated measuring. You measure only once for each operation. Once the four positions are set, you just index.

Write for complete information

SPECIALTIES

MANUFACTURING CO., INC.

25 Farrand Street, Bloomfield, N. J.

PART NUMBERS



MODEL 175

LETTERING

GRADUATIONS

ROLLED

BY MACHINE

FLAT & ROUND SURFACES

Sure - Fast - Accurate

OBSOLETES HAND STAMPING

SAVES LABOR STAMPS

Eliminates POOR MARKING ERROR - NOISE

Speeds . . DELIVERIES

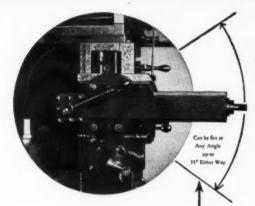
ALSO ADAPTED TO CERTAIN KNURLING OPERATIONS

This Hydraulic Machine will mark piece parts quickly and accurately. It is serving in the war effort in many plants for marking components of guns, tanks, planes, motors, engines, shells, and practically every metal part produced for war equipment. Machine will mark unlimited number of sizes and shapes when equipped with proper tools and fixtures. It will also do an excellent knurling job on solids and shells of small diameters.

Designed and Built By

GEO. T. SCHMIDT, INC.

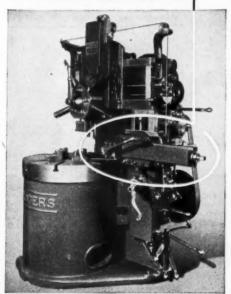
1802 BELLE PLAINE AVENUE CHICAGO 13, ILLINOIS



Swing it

Swing it

ON ROGERS "Perfect 36" VERTICAL TURRET MILLS



Greater flexibility, quicker and easier set-ups, and more accurate finished work are actual realities with the exclusive Rogers Swivel Side Head. This side head swings up and down 35 degrees each side of the horizontal.

Such an outstanding feature on Rogers "Perfect 36" Vertical Turret Mills together with simplicity of design, operation and universal adaptability produces more output per hour.

NOTE TO INDUSTRY

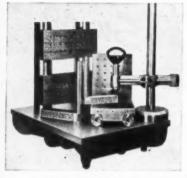
If you turn, bore, drill and thread ferrous or non-ferrous castings and forgings up to 36", check with Rogers for:

- √ LOW PRICES
- V QUICK DELIVERY
- ✓ STANDARD AND HIGH SPEED MODELS

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ROGERS MACHINE WORKS, INC.

Sales Offices:
1813 Elmwood Ave., Buffalo, N. Y.
Factory: Alfred, N. Y.
Knowing How Since 1885

INSPECTION COMBINATION



A new three-part precision inspection combination is designed for an extremely wide range of angle checking and features a 7x12x12" sine angle square.

The square permits right and left hand horizontal angle measurement up to 75°. When used in conjunction with a surface plate angle plate, vertical right and left hand angle measurements can be attained, together with a wide range of projection checking. It may also be used separately as a small surface plate angle plate.

The second unit of the combination is a heavy type surface plate angle plate with hardened and ground cylindrical posts and cross plates. Posts are hollow and ventilated to balance inner and outer temperatures. Base is made with extra heavy reinforcing ribs of special design to maintain accuracy.

Third member of this group is a utility tri-square made in sizes from 4 to 16. Among its special features is the solid cylindrical post for point of tangency and line accuracy, inside, outside, and sidewise.

Steel in all three instruments is aged, heat treated and tested to 60-64 Rockwell C hardness. Instruments can be reconditioned economically if unavoidably abused. Also offered individually, the three products are described in an illustrated folder available from the Thomas Tool & Machine Co., 66 North Park St., Pontiac, Mich.

a little

PRODUCTIMETER

that does a BIG counting job!

black figures . . . available in sizes to count from 1000 to 1,000,000. • There's a unit in the Productimeter Line to meet practically every need, in Stroke, Rotary, Lineal and Electric models.

Bulletin No. 100—a concise, ready reference catalog of 100 standard models — sent at your request.

DURANT MANUFACTURING COMPANY

1928 N. Buffum Street Milwaukee 1, Wis. 180 Eddy Street Providence 3, R. I.

PRODUCTIMETERS

KALAMAZOO Metale BAND SAW



DRY MODEL

Machine illustrated is suitable for intermittent cutting.

WET

Coolant attachment can be supplied for above machine or machine can be purchased as a complete unit with coolant. Attachment does not interfere with convenience or portability and permits high speed, continuous, straight line cutting.

Thousands of progressive war plants have learned that the Kalamazoo band saw is far more efficient, convenient and accurate on most of their cut-off work than other methods. They have learned that this compact, low-cost machine can do most of the work heretofore handled on large, expensive machines.

This equipment has pointed the way to increased savings NOW and also on after-the-war production.

Two sizes — $8'' \times 16''$ and $8'' \times 24''$. Cuts solids, tubes or odd shapes. Four speeds for cutting any metal. Portable and plugs into light circuit.

WRITE FOR BULLETIN OR ASK YOUR DEALER

MACHINE TOOL DIVISION KALAMAZOO TA

KALAMAZOO TANK & SILO CO. Kalamazoo, . Michigan



SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate ideal for small tool and die shops—saves time these five different ways:

- Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
- 2 Saves time and expense of drawing or tempering small metal parts in large furnaces.
- 3 Cuts handling time when normalizing or annealing small parts. No waiting.
- Conveniently available for pre-heating for subsequent high-speed hardening.
- 5 Eliminates shut downs and delays in servicing emergency repair orders.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$124.00°
MH-4	10"W 6"H 18"L		4800	20.9	\$191.00°

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—\$152.40.



REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, addi-

tional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
36 SCUTH SHELBY STREET . INDIANAPOLIS 7, IND.

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

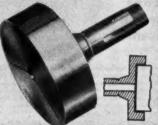
For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The Precision name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify Precision when ordering from your dealer. Literature on request.

- MODEL 3AT: For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- . MODEL IA: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

KLUTCH - KOLLET (Step Chuck) for chucking work to 2³/4" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, IA adapters only. List unbored \$7.50 each.





PRECISION COLLET DIVISION 265 Can

265 Canal Street, New York 13, N.Y.



5C

Adapters for

3AT, 3C, 1A

480 (AC-50)

OPTICAL FLATS AND MONOLIGHT

Greater wearability and lower coefficient of expansion are claimed for the new DoAll Optical Flats manufactured by Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis 4, Minn.



The Flats are made from fused Brazilian Quartz which has a hardness of seven on the Moh scale as compared with six for optical grade glass. Having a much lower coefficient of expansion than pyrex or optical grade glass, DoAll Optical Flats

Twin Lens Helmet Assembly

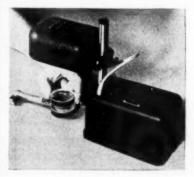
Here is an economical and practical unit for welders who perform a wide range of welding operations. Comes equipped with two divided lenseseach 2x2 inches in size-instead of the conventional single lens. The helmet has a special twin lens holder, and assembly includes an assortment of three leases-light, medium and dark.

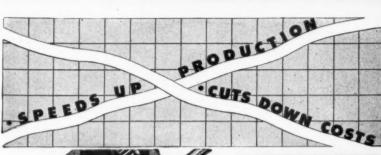
Manufacturing Co. Chicago 22, III. 446-6 N. Aberdeen St.

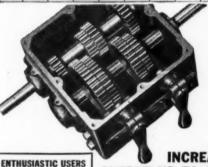
are said to remain flat even after considerable handling.

Six sizes in diameters of 2, 3, 4, 5, 6 and 10" are available, each flat being packaged in a convenient hardwood case. The Flats carry marked accuracy guarantees show-ing variance in absolute flatness. They are available in grades of accuracy of one millionth for laboratory gage block and instrument inspection and two millionths for checking instruments and fine tools.

For a monochromatic light having large adjustable capacity as well as compactness, Continental offers its DoAll Monolight using helium light rays. Helium is used because it is obtained in a highly purified form, one wave length only and has a more distinguishable color-yellow. The light is high in intensity which concentrates the light on a smaller area, giving greater illumination for distinguishing the light wave unit known as the "fringe" or interference band. The rays from this light, when observed thru the Flats produce interference bands of 11.6 micro inches. These interference bands are used to measure flatness, height, and parallelism. It is possible to read accurately within "millionths" of an inch, variations in the size and flatness of parts when viewed thru the combination of optical flat and monolight. Capacity:-Maximum height lamp to table-12"; Minimum height lamp to table—8½"; Projection Head Tilts—90° up and 21° down; rotates—360°; Projection Head—Removable for inspection in hand; Net weight—12 pounds; Operating Current—110 V 60 cycle, single phase. Illustrated useful information on Optical Flats and Monolight is available on request.







INCREASES OUTPUT UP TO 300% American Brake Shoe &

Many of the famous companies listed at the left report production increases ranging from 25% to 300% and drastic reductions in costs after installing Turner Uni-Drives.

There are no belts to shift on the Uni-Drive. Drives to large step of cone at all speeds. Eliminates overhead line and counter shafts. Provides all advantages of geared head with belt drive smoothness. See your dealer or write for details.



FOR Brown & Sharpe and Cleveland Automatic Screw Ma-chines; Lathes, Shapers. Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines.



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The TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Co.) 3416 Terrace St. Kansas City 8, Mo.

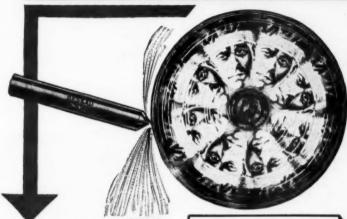
PRODUCING MACHINE ORDNANCE TOOLS . AIRCRAFT FITTINGS



Many of America's leading manufacturers have learned that most of the quality cutting tools listed in the new Arnold catalog can reach them surprisingly fast. For instance, three types on which you can expect almost immediate delivery are illustrated above. They are: counterbores. straight and taper shank with interchangeable pilots and Woodruff key seat cutters. Arnold's thirty years of toolmaking experience can provide you with cutting tools that can be depended upon for maximum efficiency, service and accuracy. If you do not have our new 40 page catalog containing the complete Arnold line, send for it at once. No obligation.



RIGHT DIAMOND TOOL!!!



ACHE out of the toughest wheel dressing job. DESSAU DIAMOND TOOLS are right! Every diamond must pass the most rigid tests for hardness, shape and construction before it is set into your specific type of tool.

We invite your inquiries and the privilege of helping you solve your diamond tool problems.

Available for Prompt Delivery

- . Single Stone Dressing Tools
- · Multiple Point Diamond Tools
- · Shaped Diamond Tools
- Phonopoints for Fine Radius Dressing
- Thread Grinding Tools
- Hardness Tester
- · Diamond Powder

Dessau Diamond Dressing Tools are recommended for use on Cincinnati, Landis, Norton, Heald, Brown & Sharpe, Excello, etc., grinding machines.

Write for newest catalogs and price lists.



MAURICE S. DESSAU CO.

Industrial Diamond Impurters

Diamond Inal Manufacturers

535 FIFTH AVE. . Transport Paradiction 1472 . NEW YORK, N. Y.

Dessau Diamonds True the Wheels of Industry

KENNAMILL CUTTERS



Kennametal Inc., 135 Lloyd Ave., Latrobe, Pa. announce a line of inserted-blade cutters, known as Kennamills, for step-milling of steel. These new cutters are available in four sizes:—2" with 3 blades; 3, 4, and 5"—each with 4-blades. The 2 and 3" sizes have taper shanks to fit Nos, 40 and 50 spindles; the 4 and 5" sizes have taper shanks to fit No. 50 spindle only. All sizes use the same standard replaceable Kennametal-tipped blades. Two sets of blades are supplied with each cutter head.

It is claimed Kennamills permit highspeed carbide milling of steel with the same smoothness of operation attained with multiple blade cutters, yet are as simple to maintain as fly cutters. Tool and cutter grinders are not necessary, since blades may be removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary as each blade cuts an in-

dependent path.

Similar designs of cutters with one or two Kennametal-tipped blades were improvised during the past four years for fly-cutting of steel. In numerous shops they have permitted rapid, high quality work even by inexperienced operators. Kennamills are a distinct advancement in fly-cutter milling technique, since on cuts of over ¼" depth the hp provided by modern milling machines can be fully utilized.

IDEAL ACCESSORIES

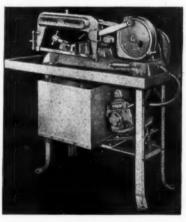
The Machinery Products Div., of Ideal Commutator Dresser Co., 1441 Park Ave., Sycamore, Ill. has issued a 12-page catalog on their machine tool accessories vital to war production. This equipment includes magnetic chucks, triple-duty live centers, "etcher-demagnetizers", electric tachometers, grinding wheel dressers, variable speed transmissions and electric cleaners. The bulletin contains a brief foreward which gives a short history of the company since its beginning 27 years ago.

EXCEL POWER HACKSAW

A new Excel Power Hacksaw is made in both floor and bench models, for wet or dry sawing. It was designed primarily as an auxiliary and standby unit and for requirements of smaller shops.

The floor model takes only 143/4x31" in space and the bench model even less.

The unit has a high capacity for its size as it will handle any work up to 4" square stock. A quick action vise holds work securely in place and cuts can be made at any angle up to 45".



A wide range of cutting jobs can be handled at high rates of speed. Soft materials such as aluminum, bakelite, fibre, cast iron, etc., are cut at the rate of 80 strokes per minute. Medium materials such as annealed tool steel, alloy, machine steel, are cut at 60 strokes per minute. Hard materials such as spring steel, are cut at 40 strokes per minute.

Bulletin MMX giving complete information and specifications, parts list and installation data as well as operating instructions, will be sent on request to Covel Mfg. Co., Benton Harbor, Mich.



WE USE 'EM AFTER WE BUILD 'EM SO THEY GOTTA BE RIGHT!

TEMPE

DESIGNERS • BUILDERS • USERS

OF

PRODUCTION - PROVED MACHINES

NEW INTERNAL AND SURFACE GRINDER

Compact, powerful, versatile, fast, economical, and accurate. We use 'em on production lines and in the tool room. Exclusive Lempco Auto-Sizer enables successive pieces to be duplicated exactly—automatically! Automatic power cross-feeds. Screw and rack and pinion infeed. Turns and grinds internal, external, surface, and taper jobs.

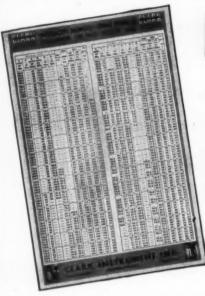
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LEMPCO

5729 DUNHAM ROAD BEDFORD, OHIO, U*S*A



PROMPT DELIVERY! CEILING PRICED!



FREE!

THIS 24" x 32" WALL
CHART GIVES ROCKWELL
BRINELL, SCLERO, VICKERS HARDNESS AND
TENSILE STRENGTH CONVERSIONS

• If you are a production executive whose responsibility includes the hardness testing of metals, you will certainly want one of these new charts for your office, shop, or laboratory. Handsome in appearance, printed in three colors, with the very minimum of advertising, it will prove its value every hour of every day. Type is large, easily read at a distance of several feet, yet the chart itself is only 24" wide and 32" high — about the size of a calendar.

Although a chart like this is relatively expensive to produce, and the quantity is rigidly limited, a copy is yours — free for the asking — if you request it on your letterhead. Write Dept. MT, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.





Give WZWGS To production!



Revolving Air Cylinders

"AIRGRIP" Revolving Air Cylinders, on double ball bearings permit speeds formerly impossible. Minimum maintenance. Today's top speed and peak efficiency requirements in air chucks demand superior air cylinder performance and service. Under average conditions, the cylinder will run for years without attention. No manual adjustment of packings. Wear automatically taken up by air pressure within the cylinder.



"AIRGRIP" CHUCKS

Boost output records, slash costs. "Airgrip" Chucks double gripping power, externally or internally. Work held tight, even if air supply is cut off completely. "Airgrip" 2- and 3-jaw Universal Chucks permit heavier cuts; coarser feeds.

HI - PO SUPERCHARGED HYDRAULIC PRESSURE PUMPS

3000 lb.-Pressure Pump, driven by α ½ h.p. motor! Double-Pressure Production; low-pressure section supercharges α high-pressure section. Builds up pressure fast, with minimum pulsation.

Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

Anker-Holth Mfg. Co.

2729 CONNORS STREET

PORT HURON MICHICAN

SAFETY SHOP SERVES WORKERS ON THE JOB-Walter Kidde & Co., Belleville, N. J., pioneers in the development of car-bon dioxide fire-fighting equipment, is beating ac-cidents to the punch with a mobile safety shop which travels from plant to plant giving workers the oppor-tunity to purchase protective clothing on the spot. Stocked with safety shoes, goggles, face shields, respirators, gas masks, and such protective clothing as aprons, smocks, gloves and caps, the shop is rolled to workers at their machines where garments are fitted by the safety serviceman or arrangements are made for the cleaning or repairing of worn safety equipment. The safety shop stays three or four days in each plant.



AIR PROCESSING

"Air Processing Equipment" is the title of a new catalog just released by Petersbalton, Inc., designers, engineers and manufacturers of industrial equipment and complete air processing systems, 628 East Forest Ave., Detroit 1, Mich.

This 56-page book shows innumerable installations of Peters-Dalton dust collecting units and systems, spray booths and equipment, ovens and ventilating and completely engineered air processing systems. It tells an interesting story of Peters-Dalton complete engineering facilities, and includes detailed specifications of Hydro-Whirl Dust Collectors and Spray Booth units together with engineering data of immeasurable value to those with air handling problems.

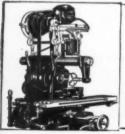
air handling problems.

A copy of this spiral bound catalog will be mailed without charge to plant executives who request it on their company

letterheads.

NEAR INFRA RED BROCHURE

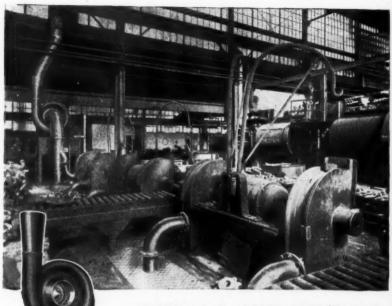
An attractive, well illustrated 12 page brochure entitled "Good Things Come in Small Packages" has recently been issued by the Fostoria Pressed Steel Corp., Fostoria, O. Considerable information is given on the use of near infra red in small installations and it is to these particular small installations that the at-tention of this booklet is directed. The manufacturers claim that the part which the near infra red process plays on these smaller jobs, results in speedier completion and improved quality. Required to produce according to specifications and on time, plant officials have frequently found the near infra red process to be a solution of their baking, drying, de-hydrating or preheating problems. Many illustrations of actual job set-ups are given, along with case histories and performance data.



The drive that stays in service.

A "short" in a motor can't "gum up" production from a machine tool equipped with a Remco Drive. Simply unbolt and remove the dead unit and substitute another motor—a matter of minutes. Only the Remco Drive has a patented universal motor mounting which takes any motor of reasonable size—new or USED. Nothing else like it! Write... Remco Products Corp., State St. at R. R., York, Pa.

REMCO MOTOR DRIVE for LATHES, SHAPERS, DRILLS, MILLING MACHINES, ofc.



THERE IS A ROTO-CLONE FOR EVERY GRINDING DUST

There is a type and size of Roto-Clone for every dust requirement — equally effective for all types of metal grinding service, from rough snagging in foundries to finest finish grinding in the production of precision equipment.

Roto-Clone offers exclusive advantages of economy of space and piping combined with low power consumption and highest efficiency in dust separation. Send for complete engineering data and Bulletin No. 272.

Type D Roto-Clone

The original Dynamic Precipitator for the dry collection of granular dust — capacities from 200 to 20,000 c.f.m.



AMERICAN AIR FILTER COMPANY, INC., 312 CENTRAL AVE. IOUISVILLE, KY.

H CARADA, DARLING BROTHERS, LIMITED, MONTREAL, P. G.

HERE'S WHY BOKUM

Have Long Life...

YOU SHARPEN



ULEARANCES are not effected by repeated sharpenings.

Each tool will take thousands of sharpenings without causing its form to change.

The original form remains constant due to the angle of the cutting edge and the helical backed-off form of front of tool.

Thus, sharpenings being made on the line of radius, life of tool is equal to the number of sharpenings represented in its circumference.

The same unique design that characterizes this general boring tool (Style A) also distinguishes the two other types of Bokum Tools—Style B for facing and bottoming and Style C for internal threading.

For super High Speed Tools ask for Catalog H-1139 and for Carbide Tipped H-398.

BOKUM TOOL CO.

14775 WILDEMERE AVE. . DETROIT 21, MICH

WHAT'S NEW " COLLET CHUCKS!

LARGER SIZES THAN EVER BEFORE!

3/4" 1" 13/4" 23/4" CAPACITY CAPACITY CAPACITY

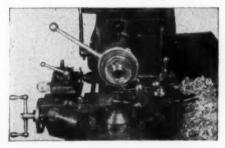
"MASTER" Collet Chucks

for any Size or Make of Machine

You can now get collet chucks of larger capacity than have ever before been made—four standard sizes ranging up to 234" round—also special sizes of larger dimensions, as desired. Readily adaptable to machines of all sizes and makes—lathes, screw machines and grinders—and for ANY OPERATION requiring a chuck.

Increase the production rate of your machines by changing over today from key chucks to MASTER Collet Chucks!





23/4" Capacity Master Collet Chuck on Bardon & Oliver No. 8 Screw Machine



Collet of special design, actuated by hardened steel balls, produces powerful gripping action. No stock slippage! Hand lever engages or releases collet without stopping the work head. Precision built. All working parts hardened and ground, insuring long life.

> Write for Literature

UNITED INDUSTRIES

CUTTING TOOLS . . . GAUGES . . . FIXTURES

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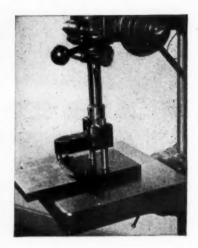
BACK SPOTFACING DEVICE

A novel approach to the solution of a vexing shop problem is offered by Edlund Tools Inc., 4473 Woodward Avenue, Detroit 1, Michigan. This new back spot-facing device, in the form of an offset drill-head, offers an easy means of reaching holes obstructed by overhanging flanges, a condition frequently encountered in aircraft parts.

The tool comprises a body casting housing spur gear trains which transmit power from the drill press spindle to a spindle in the nose end of the casting carrying the cutter. The cutter spindle is rigidly mounted in a combination of ball and needle bearings.

The tool is mounted in any standard drill press in the same manner as a drill chuck, by means of a Morse taper shank. A floating tool holder is recommended in case there is any run out of the drill spindle. Capacity of the tool is limited only by the size of the drill press. Designs have been projected to take care of cuters up to 3" in diameter, but larger sizes are entirely within scope of the design.

The illustration shows the smallest model which will take up to 56" diameter spotfacing cutter in non-ferrous metals.



The minimum head clearance required is 1%".

USE

Fluid-Motion for Modern form-dressing

ONE SETTING HANDLE CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable — regardless of cost.

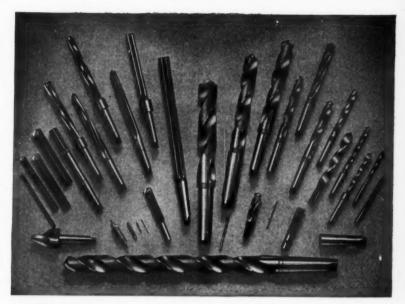
FEATURES

Fluid-motion dressing .0001" accuracy Automatic centering 14" wheel capacity Large range yet compact Chatterless and dustproof

J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 2, N. J.





Victory IS BUILT INTO THEM

THESE are the seasoned disciplined, shock troops, the spearheads of attack in the constant war on costs—these Celfor Reamers and highspeed Twist Drills.

Two good examples of the victorious quality built into Celfor tools are the Celfor Type B Reamer—made only by Clark; and Celfor high speed Twist Drills, forged to shape, then twisted while hot to densify the metal for greatest durability. The Celfor process preserves and increases the inherent strength and toughness of finest tool steels—produces tools that can not be excelled for strength and cutting qualities.





Take this simple, victorious step toward savings in man-hours, longer tool life and lower tool costs: send for the facts about Celfor Drills and Reamers.

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

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WELDING CALCULATOR



A new calculator, designed for readily determining welding preheating and interpass temperatures of steels in those few cases where experience indicates need for preheating to obtain best welding results, is announced.

Calculator is 61/4" in diameter and comprises four movable sections of heavy cardboard stock. Complete instructions in the form of six simple steps are printed on outside sections.

Altho most steels are readily weldable and require no preheating because of low carbon and alloy content, this calculator will serve as a convenient guide in instances where steels have a higher content of carbon and other alloys and require preheating to minimize tendency toward excessive hardening and possible cracking of base metal adjacent to weld.

The calculator, available thru The Lincoln Electric Co., Cleveland, (1) Ohio, is priced at 25 cents, postpaid, anywhere in the U. S., (\$.50 elsewhere).

ZAGAR TOOL BULLETIN

An attractive, new 4 page bulletin has Lakeland Blvd., Cleveland, 17, Ohio. It presents, for the most part pictorially. new Zagar equipment for indexing and holding. Quite a number of illustrations show the equipment in actual use on a wide range of jobs and study of the bulletin may give some helpful hints for similar applications.



HAND CUT GROUND SOLID

There is a GROBET ROTARY FILE in shape, size and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. GROBET FILES do their job better and stay sharp longer.

Send for catalog W.R., the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters. Chatterless, Countersink, etc.



421 Canal Street



New York, 13 N. Y.

MFRS. OF GROBET ROTARY FILES

Today machine shops must be equipped to grind odd-shaped forms. To do this precisely requires dressing the abrasive wheel to the desired contour. No. 41 does that, accurately, quickly.

Contour Angle

At Last... It's Possible!

Now Even the Operator of Limited

Now Even the Operator of Limited

Experience Can Dress and Re-dress

ABRASIVE WHEELS

Accurately and Quickly to

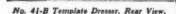
ANY CONTOUR!

Plus regular radius and angle Dressing

Virtually any desired contour can be generated on abrasive wheels by placing a template of the curve in the clamp of No. 41-B. A spring-activated plunger follows the contour of the template as the operator simply turns the knob. As he turns it, the chisel pointed diamond of the dresser moves across the face of the rotating abrasive wheel, dressing it exactly to the shape of the template.

Flexibility, accessibility of parts for cleaning, and simplicity are

among the features of No. 41-A Radius and Angle Dresser made possible by expert engineering design.



After the wheel is dressed by the chiselpointed diamond, it fits the template accurately. When worn, it is quickly redressed to the same contour.

With its base, No. 41-A does all the usual jobs of a quality radius and angle dresser. Yet its cost is remarkably low.

Write for Booklet A

LIMITED TERRITORIES OPEN



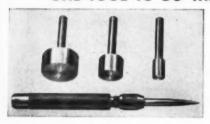
No. 41-A Radius and Angle Dresser. Front View.



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ONE TOOL TO DO THE WORK OF THREE



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- 2. Set of Plug Gages
- 3. Machinists' Scriber

Complete set of 147 pieces only \$114.30

Write today for complete information on this new PEC tool

PRODUCTS ENGINEERING CO.

9045 Wilshire Blvd., Beverly Hills, Calif.

LANDIS 10"-14" TYPE CH PLAIN HYDRAULIC GRINDERS

Landis 10" and 14" Plain Hydraulic Grinders have been provided with numerous important refinements and are now being offered under the designation "Type CH".

The demand everywhere for greater accuracy and better finish but with no lessening of production has been responsible for practically all of the changes. In line with this, wheel feed mechanism has been completely redesigned. A large micrometer ring at rear of feed-up handwheel permits accurate setting for desired amount of hand

feed. Graduations on ring are normally read in thousandths in terms of work diameter reduction. Making a simple adjustment permits same graduations to be read in tenths of thousandths.

Automatic hand feed, considered standard on power traverse machines, is built



into wheel base. It is automatically reset at end of each grinding cycle. This simplifies operating procedure and eliminates spoilage due to operator forgetting to reset wheel when changing work pieces.

Hydraulic straight infeed is supplied only on order but when it is furnished.

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Learn more about these Chrome Steel Files that have woft a reputation for utmost precision and durability.

GROBET FILE CO. OF AMERICA, 421 Canal St., New York, N. Y.

BOX MILL CUTTER GRINDING FIXTURE

With this new fixture any apprentice can grind tools to the rigid accuracy required for modern precision cutting.

The important angles are predetermined and ground accurately so that the cutter will be brought back to its original condition. This fixture is made of tool steel, hardened and ground to insure long life.

It can be used for grinding carbide tipped or high-speed cutters, and is designed for use on any surface grinder. One fixture may be used for all sizes of similar cutters.

The illustrations show the application of this new fixture in grinding the cutter for Warner & Swasey Single Cutter Turners. Similar fixtures are available for any of the well known makes of Turners.

Prices and delivery upon application.







EQUIPMENT MANUFACTURING, INC. 8646 Grinnell Ave., Detroit 13, Mich.

the automatic wheel feed feature is still retained. Stroke of hydraulic straight infeed is adjustable from 1" to 3½" and slow feed from 0" to 1.20" on work diameter. A special hydraulic straight infeed arrangement is available for use when check grinding, in which case slow feed is adjustable from 0" to 1". Changes in oil viscosity due to temperature changes are prevented from influencing accuracy of feed by an automatic compensating device.

There are many other interesting features, details of which are available from Landis Tool Co., Waynesboro, Pa.



The Standard of QUALITY

All standard sixes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest quality and service at attractive prices.

Write today for prices,

Few Territories Open.

QUALITY TOOL WORKS Market St., Waukegan, Illinois AERO COUNTERSINK



Filling the need of precision countersinking of large rivets, bolts, and screws, the Aero Tool Co., Burbank, Cal., has developed a large size micrometer s to p countersink. The new tool countersinks up to 1½" and is capable of countersinking ½" rivets. The countersink can be instantly and positively locked at each micrometer setting in increments of .001". Adjustments are made manually eliminating need of an adjusting tool and can be made while tool is in operation. Standard countersink includes precision ground interchangeable 1" diameter cutter, available in 72, 78, 82, 100, 110, and 115" angles with or without integral pilot. Radial bearings are of bronze and thrust

Radial bearings are of bronze and thrust bearing is of ball type. Stop is spring loaded for positive action and safety.



EMERY WHEEL DRESSER

A mechanically correct dresser with cutters made of steel of our own specification. Cutter set provided with revolving sleeve that turns uniformly and prevents grooving of spindle. Patented spindle bearing. Also patented handle cap that serves as

bearing clamp, eliminates set screws and eliminates moving parts that wear.

The Champion Dresser will outwear many cheaper dressers . . . a fact proved for years by thousands of shops.



Will Not Mar Metal or Plated Finishes —

The New
PYRALIN
TIPPED
MALLETS

The only Pyralin Mallet on the market with threaded tips replaceable by hand. Plastic tips are quickly and easily screwed into the solid "nonsparking, non-magnetic alloy heads" when replacements become necessary.



These handy shop tools take the place of rawhide, wood and copper mallets — and do a better job. Oval hole drilled in head prevents handle from turning or coming off. Widely used in aircraft and war industries. Let us send bulletin giving sizes and full information.

SOUTHWEST MFG. CO.

1615 EAST FIRST ST. - Dept. B-6 SANTA ANA, CALIF.



THE MICRO-TURNTHREAD

A N ingenious and versatile new lathe attachment has been developed by Blank & Buxton Machinery Co., 3100 E. Michigan Ave., Jackson, Mich. Known as the Micro Turn-Thread, it is designed to overcome the difficulty encountered in turning or threading long, small diameter shafts.

The device is a combination tool holder and follow rest, installed in the lathe tool post and its construction and use will be revealed by the accompanying pictures.



Fig. 2—Cutting Acme threads on a long shaft. (Halftone screen in the cut has distorted the thread outline.)

Embodied in the tool holder are rollers with screw adjustment for variation in work diameter. Micrometer adjustment of the cutting tool itself is provided. Also, a quick retractability feature for moving the tool in and out at beginning and end of threading cuts. Retraction is effected by means of a toggle.

In development of the tool, it was soon observed that the quick retractability feature could be used for forming and cut-off work. This suggested a quick change tool method, whereby a set-up could be made on the lathe and the operator could change tools rapidly in the making of certain types of studs, bushing, washers,

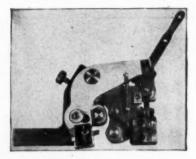


Fig. 1-Model "A" is especially useful for turning and threading operations.

The Model A attachment is shown in Fig. 1, and is available for right or left hand turning. This design is intended primarily for turning and threading. It is also suitable for light forming and cut-off operations. The follower rolls are adjustable for diameters from ½ to 2". A piece of 1½" diameter solid round may be cut-off with a ¾" square tool bit. Also, any forming can be handled which does not require a tool wider than ¾".



Fig. 3-Ordinary washers are speedily made with this handy lathe attachment.

/ The right hand attachment has the tool following the rolls and is used on finished shafts. The tool precedes the rolls on the left hand model. It can be used on hex, square or rough forged shafts. The rolls run on the finished cut, insuring the same diameter finished cut for the whole length of shaft, regardless of play in spindle,

It's an exact job . . . making synthetic rubber

Making synthetic rubber is a precise operation. The relative quantities of various liquid ingredients are one of the most important of all factors.

It's significant that National Synthetic Rubber Corporation, of Louisville, as well as all other producers of synthetic, chose batteries of Bowser Meters for this difficult work.

This 100 per cent selection of Bowser was guided by past performance in similar work and by the records of accuracy and dependability that Bowser Meters have estab-



lished in hundreds of industries over scores of years.

Meters are only one phase of Bowser Exact Liquid Control. Here's a typical case history:

An Indiana plant installed Bowser Filters on tapping machines. First week after installation, tapping production increased 17% and scrap was reduced 56%. The following week, the figures were

19% and 53%. And, twice as many shells were tapped between dressings. That's Bowser economy! Bowser, Inc., Fort Wayne 5, Indiana.

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Not only has Bowser's war production earned the Army-Navy E... Bowser equipment has helped earn it for scores of other companies.



The Name That Me**ans** Exact Control of Liquids



June, 1944

or looseness of saddle or cross slide. After cut is started, no tailstock is needed because the attachment itself holds the work centrally. Work can be performed on shafts three or four feet from the chuck without any tailstock support.

Fig. 2 shows the attachment being used in the cutting of Acme threads with a left hand attachment.

Fig. 3 shows the facility with which ordinary washers may be made on an en-gine lathe. It also illustrates use of the

quick retracting feature.

Fig. 4 shows the setup for plunge cut-ting, demonstrating how this kind of work may be done on the end of a shaft, a considerable distance from the chuck without any tailstock support.

Fig. 5 shows the Model B attachment, designed to incorporate a quick change of tools. This is accomplished by having a separate tool holder for each tool.

A projecting pin will be noticed in the attachment. This pin has a slot turned in the upper portion. This slot has an angle on the outer side, and the tool holder is bored and counterbored. The bore is a slip fit to go over the pin and the counterbore is bored to precision depth. Bottom of the counterbore has the same angle as the angle on the outer side



Fig. 4-Showing set-up of attachment for plunge cutting on a long shaft.

of the slot on the projecting pin. When the toolholder is slipped over the pin, up against toolholder arm, it automatically drops down into the slot. The angle in the slot naturally draws the holder tightly against the arm. Toolholder and toolholder arm are both stepped so that toolholder is backed up by projecting



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By eliminating complicated pulley arrangements and costly lineshaft maintenance, Masterdrives power surface grinders for maximum efficiency and economy.

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ERRINGTON MECHANICAL LABORATORY

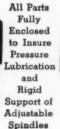
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Tapping Heads

Hitler and his pal, Tojo, are sure to be sunk, thanks to mass production and the boys on the firing line. MASTER GAUGES are helping in this great program.

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Fig. 5-Model "B" attachment with quick-ly demountable tool holders.

step on toolholder arm. The heavier the load on the tool, the more tightly is the toolholder locked. When cut is finished,



Fig. 6-Showing Model "B" attachment in action. Finished piece is on cross slide.

tool is retracted from the work and the operator merely picks the toolholder off. The result is a very quick change of tools without use of any thumb screws or wrenches of any kind. The 1/2" slot permits operator to use 1/2" square tool bits or 1/2"x3/4" tools which can be ground for forming or broad facing.



★ Draws in and releases collet with air speed but without costly air operation. Self - ejecting, self - cleaning, chip-sealed to prevent clogging and lost time.

1/2" cap. uses 1A col. \$32.50

1/2" cap. uses 3AT " 5/8" cap. uses 3A " 35.75 35.75

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The MASTER JEM block has positive lock jaw device (a new feature), reduces locking effort 75%.

Three gansmith finish boring bars with 45 and 90 degree bit angle for 1/4, 5/16,

and % tool bits are included. Also one high speed forged threading tool for internal threading.

The two split reducing bushings included permit changing of bars within a few seconds. The MASTER JEM is adaptable to any size or make of lathe. Price, one complete set, packed in box, \$9.50. Write for illustrated bulletin.

MEYER TOOL & ENGINEERING CO.,

Saginaw, Mich.



DIX MANUFACTURING COMPANY

PRECISION MADE PRODUCTS

Fig. 6 shows the Model B tool in action on a lathe. The cutoff tool is cutting off a piece, a sample finished piece is lying on the cross slide. The turning tool holder is shown at the left on the saddle, ready to be mounted for the next piece.

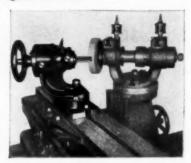
The attachment opens a wide range of possible uses and applications. It is simple and sturdy. The makers admit that they have just begun to explore its many uses. Right now when maximum war production is a must, the attachment opens new possibilities in permitting precision work on old lathes which otherwise would be unsuitable for close work.

HYBCO GRINDING FIXTURES

The standard heads from Hybco tap grinders now have been adapted so that they may be used on any Universal tool and cutter grinder. The head should be especially useful in smaller tool grinding departments where the volume of work doesn't justify complete equipment.

The chamfer head was designed for sharpening chamfers of taps, but is equally effective in sharpening the chamfers of other tapered tools having evenly spaced flutes. Examples are core drills, step drills, countersinks, boring tools, etc. Eccentric relief, varied as required, is ground

on the chamfer and is produced by compound motion of the tool which is fed forward by cam action as it is rotated against the wheel.



All lands of the tool are ground equally in each rotation by repetition of the cam action over each land.

The flute grinding treatment is valuable in maintaining proper cutting edges in straight or angular flutes of tools, such as taps, countersinks, burring tools and others with equally spaced flutes. It may

DRESS GRINDING WHEELS accurately in a few seconds



If the Grinding Wheel is near the chuck like this.

with the DIAMOND WHEEL DRESSER

Easily attached to any standard surface grinder, the JIFFY be-comes a part of the machine. It dresses the wheel absolutely true, regardless of relative position of wheel to work table.

If the Grinding Wheel is way up like this.

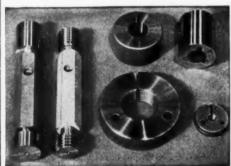
The wheel is dressed with a "twist of the wrist," in five seconds. All parts are hardened, ground and lapped, except the bracket. Write for BULLETIN No. 602W.

Manufactured by FLORIAN MFG. CO., Plantsville, Conn.

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STANDARD GAGES

As one of the four divisions of Merz service to industry, a large stock of standard, plain and threaded, plug and ring gages is maintained at all times for prompt shipment. Special gages, tools and fixtures are made to order: a complete experimental and research engineering service is available; and manufacturing of precision products on contract is done in one of the best-equipped plants in this area. Ask for literature "4 Spheres of Service," just off the press.

MERZ Engineering Company

also be used to sharpen end teeth of end mills. Its use facilitates accurate reproduction or changing of hook to suit the job. Head can be set up quickly for grinding spiral or gun points of taps.

Collets are used to hold the tools. This allows repeated grinding even after the forward center has been destroyed, and provides for salvage or conversion of chipped or broken tools. Both chamfer and flute grinding heads are available in three sizes:—(a) for tools with shank diameters up to .500", (b) for tools with shank diameters to .800", and (c) for tools with shank diameters from .500 to 1.250".

with shank diameters from .500 to 1.250".
The heads are made by Henry P. Boggis & Co., 1279 W. 3rd St., Cleveland, 13, Ohio.

MOTOR DEVELOPMENT

"Out of Thin Air" is a new brochure prepared by The Dumore Co., Racine, Wis., to tell something of the story of strides made in the design of fractional horsepower motors since the beginning of the war. This booklet, illustrated in full color, explains how the unique and exacting standards imposed upon motor manufacturers by requirements of aircraft applications have telescoped years of normal development in motor design

into a few months. These new motors incorporate safety and protective devices, versatility, controllability and durability which will be important factors in the design of motor driven products for post war homes, farms, offices. Product designers will be interested in the possibilities this publication will suggest for their own design work, and in the application of quality control to maintain precision standards in high volume production.

ZURIUM BONDED WHEELS

Something new in diamond wheels—the Zurium bonding process for locking diamonds firmly and securely in the wheel—is announced. Reports by the company indicate unusually long life for these wheels. Under ordinary care in operation, the new Super Cut Zurium bonded wheels are said by W. B. Muse, Sales Manager, to hold up under the tough applications on carbide tool grinding and finishing. Each wheel, Muse states, is capable of grinding several thousand carbide tools, thus cutting time costs, and speeding production.

A Question and Answer brochure on diamonds in industry is free on request. Address Industrial Abrasives, Inc., 3724 West 38th St., Chicago, Ill.



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screw . . . is another reason why it pays to use this product of the Master Vise Makers. The Charles Parker Company, Meriden, Conn.







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Cleveland Tapping Machine, Features: (1) Depth control within .005"; (2) Supersensitive clutch prevents tap breakage; (3) Tapping range from 10-32 to 2" N. F. in steel.

FREE!

"Guide for Production Tapping" is packed with useful data. Write today!



APPING

SPEEDY COLLET VISE



Compact and light in weight, this new collet vise will be found extremely handy for quick set-ups and a wide variety of work. Its internal piston serves as a solid stop and automatically ejects work when collet is released. Collet is drawn in and pushed out without sticking. Fast operation is assured by a long handle moving through a short throw. All working parts, including collet seat, are hardened and ground and seat is precisely at right anground and seat is precisely at right

gles to base. Seven chip guards are furnished in steps of 1/16" and the chip seal serves as a stop for shoulder work. A base outlet permits finished work to drop thru into a pan where a stop is not required. Also it adapts vise to handle long work. Uses standard collets (collets not furnished). Write Nork Products Co., Dept. 5897 S. Main St., Los Angeles 3, Cal.

ELECTRONIC CONTROL

Fundamentals and various applications of electronic control are interestingly described in a new 12-page bulletin (GEA-4126) recently issued by General Electric Co., Schenectady, N. Y.

Well illustrated, it explains the principles of electronic tubes and their operation, describes construction of the well known thyratron tube, and lists the functions of eight of the more widely used

industrial-type tubes.

It also describes and illustrates many practical applications of electronic control, including rectification, resistance welding, timing, and processing operations, as well as photoelectric installations involving counting, sorting, weighing, measuring, registering, illumination, and the control of cement kiln temperatures, etc.

"OH-38" an element of Victory!



An Aluminum Alloy-Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corresive-Easy on machine toels-Holdsthreads without stripping, its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

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BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10° Table; Model E.L. 12° Table.

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RELIANCE ELECTRONIC PREVIEW

PREVIEW of what Electronics will A be doing in connection with postwar machine tools was provided by the Re-liance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, April 29. Machine tool builders stopped off enroute from the General Motors Conference at Detroit to Pittsburgh for the Westinghouse Forum and witnessed many enlightening demonstrations. The exhibits were not confined to the laboratory for many of the setups were running on many types of machine tools in the Reliance shop under every-day operating conditions.

Among other things, an electronic unit was shown which supplies excitation to an all-electric adjustable speed drive, the heart of the unit being a single phase,

full wave, fixed voltage rectifier tube.

Another impressive demonstration involved an electronic system of adjustable speed drive operating from the regular polyphase a-c lines and furnishing speed ranges of 20:1 or better in capacities up to five hp. This system, functioning thru voltage control, has been condensed so that tubes and transformers are espe-cially compact, being housed in a small cabinet mounted in or on the machine.

In addition, a new program control was shown. Thru electronic controls, this pro-vides any number of speeds required— speeds covering the whole range of the unit on which it is applied—to be set on a series of dials and reproduced with speed and accuracy and completely independent of each other. Speed selec-tions can be handled with limit switches or similar devices for opening and closing circuits. In effect, this unit is a simple, electronic grid-controlled rectifier hooked up for conventional control, using a fixed displaced a-c rider voltage in the control grid circuit.

For example, the machines in operation included a boring machine with spindle speeds of from 25 to 1000 rpm, powered by a one hp V-S drive, providing the right speeds for a wide variety of diameters

and materials.

A radial drill, powered with a 5 hp V-S drive, was provided with a 20 to 1200 rpm spindle range, was used for drilling and tapping, including blind tapping.

A Lo-Swing lathe, using one change gear ratio (4.2:1) had a range of spindle

speeds from four to 250 rpm.

In addition there were turret lathes, dynetric balancers, drilling machines, tappers, coil winders, boring machines,



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Acme offers two complete bushing standards, the A.S.A., plus the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.



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ELIMINATE COSTLY HAND SANDING AND FILINGuse a PEERLESS SURFACING MACHINE

In many instances, a rapid cut on a Peerless may eliminate an expensive milling or planer operation. Much costly hand sanding and filing may be eliminated through the use of these machines. The advantages of a straight-grained finish and the economies in time and material resulting from use of the abrasive belt method warrant careful consideration of Peerless Surfacing Machines, 4" to 20" width of belt. Vertical and Horizontal, Also Reed High Speed Sensitive Drills.

May we send you a bulletin giving full details?

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DESMOND GRINDING WHEEL DRESSERS and CUTTERS



We can supply you with the proper Dressers and Cutters for all of your grinding wheels.

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A full line of Machinists' Filers, Welders, Production and Drill Press and Milling Machine Vises.

Let us send you our vise catalog and name of your nearest dealer.

THE DESMOND-STEPHAN MFG. CO.

URBANA · 0 H I O Fig. 1 showing cabinet housing and mounting the electronic drive controls. Transformer which reduces voltage of the a-c supply for the anode circuit of rectifier tubes is mounted by itself in cabinet base.



grinders, etc., with V-S drives, all in regular operation.

With the electronic system, somewhat closer regulation is possible for applications where wide changes in load are actually to be experienced.

Smaller speed controlling elements can also be used with the electronic system of V-S drive. This may be especially ad-

8384 South Chicago Ave., Chicago 17, III.

vantageous where, as in applications to automatic machinery, the greater cost can be justified.

The space requirements of electronic and rotating types of V-S drives are essentially the same, with the added possibility of distributing elements of the electronic unit at convenient points around the driven machine in such fashion as actually to make it appear to require less space.



Vises.

PORTAGE No. 4

HORIZONTAL BORING, DRILLING & MILLING MACHINE



 Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

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Your SLOW SPEED machines of from .08 r.p.m. and higher, 1/50 to 10 H.P., can be driven without using belts, pulleys, line shafts, chains, sprockets or slide rails, if you use one of the 47 types of Janette speed reducers.

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Janette Manufacturing Co 556-558 W Monroe St Change III

Fig. 2 showing tubes and electronic equipment mounted on front of cabinet. consisting of excitation tube. control tubes and transformers, tap switch for matching a-c voltage and pre-set rheostats.



As with the rotating system of V-S drive, it is possible with the new electronic unit to obtain controlled starting torque and controlled torque for braking and stopping. Moreover, starting, stopping and reversing operations can be controlled from one or more points about the driven machine.

Physically, the new drive has been designed to consist of a small cabinet, housing the necessary tubes and transformers, a motor connected to the load, and a "start-stop-and-reverse" push button station in which has also been incorporated the speed-changing rheostat.

Functioning of the electronic system is

C-F POSITIONERS FASTER, BETTER, SAFER WELDING And more economical too, with G-F Positioners, Permit downhand wolding of top, bottom and sides with a single setup-more uniformly perfect joints, better fillets and beads. Eliminate frequent crane-lifts, save crane-operator and sling crew time. There's a model for every need - from small, hand-operated types to giants that handlo

ed to give maximum floor and Write for Bulletin WP-22

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30,000 lbs weldments. C-F Pesitioners revolve a full 360°, tilt to 135° beyond horizontal. Table retation from 0 R.P.M. up. for automatic welding. They are

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Use these time-tested Balancing Ways for your truing and balancing operations. They save time, save labor and assure better work. Shops handling rotating parts have found these tools indispensable in meeting production schedules.

Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate test of balance.

The airplane propeller, illustrated at right, is mounted on balancing ways with 60 inch swing. Other sizes available . . . 20, 40, 72 and 96 inch swing.

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CUTS MUCH FASTER — LASTS MUCH LONGER

Diamond Tools & Wheels
To Your Specifications
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Free Engineering Service

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based on voltage control, the same as in the rotating system. Referring to Fig. 1, the transformer which steps down voltage of the a-c supply for the anode circuit of the rectifier tubes is mounted by itself in the cabinet base.

Front of cabinet is made up of three panels. One (at upper right) carries excitation tube, all control tubes and transformers, a tap switch for matching a-c voltage and four factory pre-set rheostats which establish (1) maximum and (2) minimum motor operating speeds, (3) fix the value of IR drop compensation, and (4) determine degree of starting acceleration to be permitted the mo-





J. W. Picking, Reliance Electronic Development Engineer demonstrates the ease with which any number of operating speeds, covering range of machine to which applied, can be set upon a series of dials incorporated in the new electronic speed programmer.

tor. A 45-second warm-up timer is also mounted on this panel (shown directly above excitation tube).

A second, or power panel (at upper left) carries two, three or four grid-control tubes (for converting a-c to d-c), and their filament transformers. The single-phase panel up to and including 2-hp has two tubes rated at 6.4 amperes. The 3-hp unit is 3-phase and uses three of the same tubes; the 5 hp unit uses four tubes.

The third or control panel (across bot-



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Let your men do more important jobs . . . let "Portelvator" lug things all over your plant. Or, use it as a work bench, support for overhanging work or to lift back-breaking loads.

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All-welded construction. Rolled, smooth edges,

Bins taper toward front to form convenient semi-circle—keep all bins within easy reach. Nesting, locking construct tion for rigid set-ups, easily changed when necessary.

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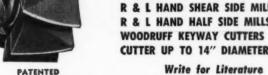
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PLAIN MILLS STAGGERED TOOTH SIDE MILLS OVERLAPPING SIDE MILLS R & L HAND SHEAR SIDE MILLS R & L HAND HALF SIDE MILLS WOODRUFF KEYWAY CUTTERS CUTTER UP TO 14" DIAMETER





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tom of cabinet front) carries all necessary contactors, relays, etc., for starting, stopping, reversing, dynamic braking, jogging and other desired operating functions. All panels are arranged with individual terminal boards for ease and speed of wiring individual groups of controls, Cable or harness-type industrial wiring is used thruout.

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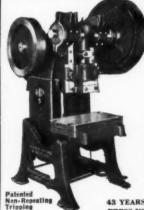
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FONDA GAGE BULLETIN

A new type of finish for gage blocks which it is claimed holds precision accuracy in gage blocks over an extended period, is described by Fonda in an illustrated new bulletin, "Precision in Millionths".



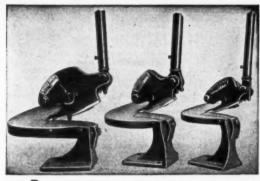
Known as the "Ultra-Finish", this new processing method was developed by the Fonda engineers, and is described by them as providing the nearest approach to a plane surface yet devised for metal. With it, gage blocks are said to require no oil or other film in wringing—thereby improving operation and avoiding any need of gage block calibration to correct errors, introduced by film, in fine-precision measurement. Fonda Gage Blocks utilizing the "Ultra-Finish" are said to have passed highest tests devised by the National Bureau of Standards.

Copies of the bulletin, which also lists the Fonda standard line of gage blocks (including Metric Sets), may be had by addressing the Fonda Gage Co., Stamford,

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With bench comparator accuracy, this portable indicating comparator is designated to measure work on the machine in ten-thousandths. To achieve optimum precision, it is scientifically constructed to compensate automatically for temperature variations. The handle is molded of Tenite plastic, which has low thermal conductivity; consequently, heat of the operator's hand is not readily transmitted thru handle to distort measurements. As a further safeguard to accuracy, the plastic handle is designed so operator's thumb will not touch the indicator. Tenite is light in weight and uniform in texture. It is injection-molded in two parts to make a hollow handle of the right weight and balance—very important for an instrument of this type.

Handles for these comparators are made in two colors—one for inspectors' and one for operators' instruments. The finish is achieved by blasting with fine sand. Handles are molded by Precision Plastics Co., Philadelphia, for Bellwether Laboratories, Upper Darby, Pa. Tenite is manufactured by Tennessee Eastman Corp., Kingsport, Tenn.



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Workmen are too valuable to sacrifice to unsafe tools. Paddock Ball-Bearing Band Saw Guides not only give an extra margin of safety to your workmen — but also increase the efficiency of every type of band-saw. Saw blades are properly supported by ball-bearing wheel guides to eliminate whipping, buckling, and breaking. More work — heavier work — on all kinds of material are easily achieved. Try a Paddock Guide 10 Days Free Trial. Results are amazing. Write today for full details.

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of a jam. We can make Centers for the Hepburn Shell Lathes.

Possibly we can help you out Send us sketch or illustration of ANY TYPE Center you require, and let us quote price and delivery.

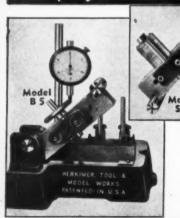
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No Difficult Operations. Involved Calculations or Intricate Manipulations.

With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these

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- 1. Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.
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Hydraulic Feed — Hand Feed

No. 2HFE Hand Feed 61/2x24

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A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality work with the COLBORNE features of spindle bearings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-800 RPM using 34 H.P. motor and cone pulleys. Collets and chuck may be used.

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Anyone can do expert drill grinding with this simpleto-use drill grinding attachment—fits on any beach grinder—saves buying new twist drills—saves time



The Complete Line of Gear and Wheel Pullers

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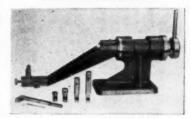
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showing STEELGRIP Standard 2 and 3 arm Wheel Pullers, special Battery Terminal, Pitman Arm, Fan Pullers and CHAINGRIP Universal Pullers.

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TOOLITE BULLETIN

A new folder is just off the press on "Toolite . . A Thermosetting Phenolic Plastic for casting tools, dies and fixtures." It explains the properties, characteristics and procedures of this new ready-compounded plastic for tooling, which claims high-impact strength, greater uniformity and more durability. The folder also illustrates the comparatively simple steps of producing tools, dies and fixtures with this new plastic material. Write Adhere, Inc., 1220 Maple St., Los Angeles.

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Super Sensitive
DRILLING MACHINE

Save on Small Drills Use the

Use the Hamilton Muchlmatt

PRECISION DRILLING FOR TINY HOLES

.004" to .250" diameter

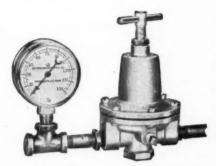
Swittly . . . silently . . . exquisitely precise . . . this drilling machine works away with unvarying satisfaction. Time and labor saving . . . dependable!

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Air Regulating Valve

new...inexpensive



These new combination regulators and valves are equipped with a special compound spring, which provides sensitive and instantaneous adjustment for all secondary pressures from 1 to 150 lbs. Send for bulletin No. 83-B—Dayton Rogers Manufacturing Co., 2847 12th Avenue South, Minneapolis 7, Minnesota.



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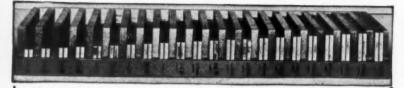
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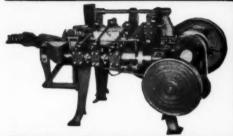
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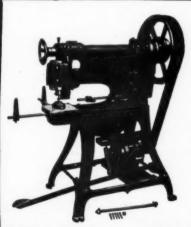
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The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the leatures of this machine. Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

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Outperforms conventional Riveters on numerous jobs.

A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

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Stroke		2"	2"	21/2"
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Throat	Depth	43/4"	43/4"	81/2"

Now's the Time to Write for Descriptive Material and Prices.

WEBER MACHINE CORP.

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The MACHINE ILLUSTRATED

is a Double-End Hydraulic Machine equipped with Trunnion type in dex fixture for DRILLING . . . ROUGH BORING . . . FINISH REAMING . . . UNDERCUTTING . . . Piston-Pin Hole in piston . . Two complete pistons in one pags.

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Modern precision machine shops and inspection departments will find this sturdy 36'x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight

Production Special Machinery, Let

us have your Inquiry.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. Write today for full information.

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907
165 SO. BARCLAY ST., MILWAUKEE+,WIS.

1200 lbs.

DRILLING AND BORING

A new single spindle self-contained Drilling and Boring machine with a quill type spindle is announced by the Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati, 23, Ohio.

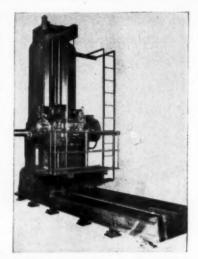
The spindle head is self-contained including its own motor and can be adapted to existing Pawling and Harnischfeger or Ryerson No. 11 or 12 drills and other similar horizontal drilling machines.

Spindle head is made in one size only, but vertical travel of spindle head on the column and travel of column on the runway can be made to suit requirements.

The machine is a development from the Gilbert 3½" machine. Controls are centralized on the head. A 7½ or 10 hp 1800 or 1500 rpm reversible motor is mounted on head and drives direct thru spur gearing to the initial drive shaft.

The spindle speed change mechanism comprises only 17 gears providing 24 speeds and only 4 sets of gears are meshed for any one speed. Gears are finished by the cross shaved process after carborizing.

The feed mechanism provides 8 changes of speeds, reverse mechanism for all speeds, and select mechanism for milling or boring feeds. Feed range is indicated by a direct reading dial.

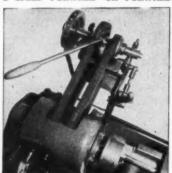


Power rapid traverse is furnished at a constant rate of 42" per minute to the

E. Z. - 2 SPEED COUNTER SHAFT

FOR LOGAN, ATLAS AND OTHER SMALL LATHES. INSTANT SPEED CHANGE.

2 SPEED FORWARD OR FORWARD AND FAST REVERSE FOR TAPPING.



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E. Z. DRILL GRINDING ATTACHMENT 3/32" dia. Minimum 1" dia. Maximum

Type 1 — \$5.95 Type 2 — \$7.95

Sharpen drills in one minute to factory accuracy.

Thousands in use by both large and small war production plants.

Send for description.

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E. Z. MANUFACTURING CO. LOS ANGELES 14, CALIF.

±.001 DEMANDS THE USE OF SHARP, ACCURATELY GROUND DRILLS. GET THEM AUTOMATICALLY WITH A

BLACK DIAMOND DRILL GRINDER



FOR SMALL GAUGE AND

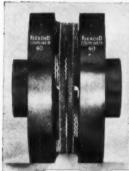
ONE Black Diamond Drill Grinder, in any average Plant, will meet all production demands for accurately ground Small Drills.

On this machine, any apprentice becomes a skilled operator . . . can produce quantities of sharp drills, ground to perfection . . . with lips of uniform length . . . correct angle . . . proper clearance for accurate drilling.

Black Diamond Grinders cut grinding costs . . . save expensive drills . . . reduce breakage . . . release skilled labor for more important work . . . and the Web Thinning attachment efficiently cares for Notched, Colton, or Crank Shaft Points.

If you use small drills, singly or in gangs—you are losing time and money unless you have a Black Diamond on the job.

BLACK DIAMOND SAW & MACHINE WORKS, INC.
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Road maintenance truck with FlexoiD coupling between Engine reduction gear and pump.

MAin 9450



FLEXOID COUPLING CO., Div. THE SMITH POWER TRANSMISSION CO. 1543 East 23rd Street Cleveland 14, Ohio

New Nesting Type Tote Pans



20" long x 12" wide x 61/3" deep. 16 ga., drag holes and handles both ends.

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spindle and 70" per minute to other units. It is selective and reversible. The 24 speeds range from 12 to 700 rpm. Eightyfour inch vertical travel of spindle head is provided and 120" horizontal travel of column, Runway is 45" wide.

NEW VICTORY VISES

Four new heavy stationary vises have been added to the line of Rousselle Victory Vises, produced by the David J. Ross Co., of Benton Harbor, Mich.

Like the swivel base vise with a 360° turning radius, the new stationary vises are made in four sizes-41/2, 7, 10, and 13".

Acmes WIRE MESH BARRIERS

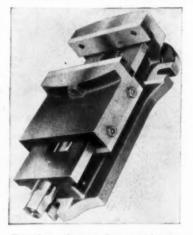


Stop sabotage—protect your fac-tory and war production with Acme Wire Mesh Barriers. That's the most effective way of safeguarding nost effective way of safeguarding tools, parts and critical materials, proventing loss, theft and mali-cious tampering. Acme Barriers provide

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Extra heavy bases and ways with extrastrength locking screws give the solidity demanded for heavy work requiring precision. The long, low and heavy base grips the machine firmly.

BRAND GUARANTEED PRECISION TOOLS

BRAND TELESCOPE GAGES are precision ground-all parts subject to wear are hardened-ground to proper radius.



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11/4" to 21/2"

INTERNATIONAL INSIDE MICROMETERS Highest accuracy-finest workmanship. Ask any man who ewns one. Sold with unconditional "Money back" guaranty.



Made in 2 sets: 11/2" to 6" 11/2" to 12"

Also M & L Precision Tappor-Sine Plates and Bars-Universal Angle Plates

BRAND TOOL & SUPPLY CO. 500 W. WASHINGTON BLVD. LOS ANGELES 15, CALIF.

New Britain UNIVERSAL VISE

THE ORIGINAL

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



NEW BRITAIN TOOL & MFG. CO. NEW BRITAIN, CONN., U. S. A.

New STEEL INSPECTOR'S STAMPS



Faster
Identification
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Different borders may be used
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All SMITH Surface Plates are "ENGINEERED"

ASSURED ACCURACY BY THE SMITH PROCESS





SCIENTIFICALLY
DESIGNED
UNDER-STRUCTURE

Smith Lapping Plates and Planer Finished Plates are of like design. Write, wire or phone. Many sizes in stock.

SMITH TOOL & ENGINEERING COMPANY 854 N. SANDUSKY AVE., BUCYRUS, OHIO It is claimed that increased accuracy and decreased rejections result from resistance of the vise to tool pressure and machine vibration. The design permits a saving in set-up time. Wide clearances have been allowed for use of wrench, affording speed in locking up.

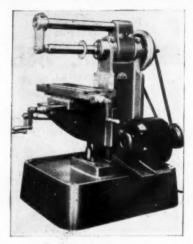
A unique cleanout hole in base of stationary jaw allows chips and waste accumulation to be removed without loss of time in the "fishing out" process.

The Vises in both stationary and swivel models—were designed to meet war-time production demands for heavy, accurate vises to hold work during milling, grinding, cutting and similar operations. Bulletins give full details.

REMOVABLE OVERARM

A removable overarm that will greatly increase the versatility of combination, horizontal, and vertical milling machines has been developed by the Benchmaster Mfg. Co., 2952 West Pico, Los Angeles, Cal.

Consisting of three parts, this new removable overarm makes it possible to use a regular milling machine arbor in a horizontal mill. It is readily mounted on machine by removing driving pulley from rear of horizontal spindle, slipping out



spindle itself by releasing two accessible screws.

A heavy semi-steel casting is mounted



4 CALIBRATION RANGES . . . wider dial graduations for easier, faster reading, more accurate tension tightening.

98% ACCURATE under most severe conditions...constructed so that shocks and jars will not interfere with mounting of dial.

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The Bendix Vernier Caliper

(A Lafayette Tool) TOTAL LENGTH: 8 INCHES

MEASURING CAPACITY 5% In. Measurements: Outside, Inside, Depth, and Depth of Threads.

SCALES: 1/16 with Vernier: 1/128 in. .025 in. with Vernier: 1/1000 in.

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HARDENED MODEL Net Price \$16.00

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PROMPT DELIVERY ON PLUG GAGES .030" to 8"

Extraordinary Improvement in Adjustable Snap Gages with Ball-tipped anvil and amazing positive locking system cannot get out of set.—Pat. Applied for.

GOOD **Prevent Spoilage** Speed-Up Operations

EASTERN PRECISION GAGE CO. HERSH TOWER BLDG., BROAD ST., ELIZABETH, N. J. on horizontal spindle which holds a precision ground stress proof overarm carrying outboard support. This particular attachment is desirable in that it is very easily attached to machine, and at the same time creates extra rigidity and support for arbors, boring bars, and special tools.

SALT BATH HEATING

An 8-page bulletin on the hardening of high speed taps and dies in an electric salt bath has recently been issued the Ajax Electric Co., Inc., Frankfort & Delaware Aves., Philadelphia, 23, Pa. The author is Paul C. Ferrin, Chief Metallurgist of Greenfield Tap and Die Corp., Greenfield, Mass.

WALTHAM CUTTER SHARPENER

The new Waltham Cutter Sharpener is designed for the fast accurate sharpening of cutters used for gear cutting and thread milling, as well as circular form tools, straight fluted hobs, and multiple cutters. These may be sharpened radially or with any desired rake angle. Maximum capacity is 2" diameter and %" thick. The machine is designed for bench use and is operated by a 1.6 hp motor on 110-volt a-c.

The Sharpener is manufactured by Waltham Machine Works, Waltham, Mass.,



manufacturers of thread milling machines and small milling cutters. This design was developed by them for the sharpening of their own precision cutters, and is backed by many years of use. Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass., is exclusive sales agent.

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STYLE 700 STACKING BOX

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A light weight box designed for quick identification of contents. Will stack with No. 303. Finished clive green enamel, baked on.

No. 703-0G—9"x131/2"x41/2"—19 ga., \$.95 Each

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No waiting when you order Greaves Silent Bakelite Gears, . We have them in stock NOW! . Your order will go forward immediately. . You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. . You'll marvel at their great strength to carry big power loads ... their remarkable ability to

successfully operate completely submerged in water. · You'll welcome their low cost. . No metal reinforcements required. . Save Time . . . Money . . . Labor! We also make silent gears of rawhide and Fabriol.



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Attachments for cleaning everything.

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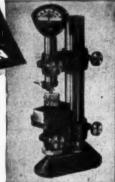


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No friction, lag or backlash . . . no racks, pinions, gears, levers, etc. subject to wear. Pointer responds instantly without swinging past true reading. Amplification is 100% mechanical, no lights or electromagnets, no warming up period required. Easily moved to different locations as there are no electrical connections. Our engineering department is at your service for applying Mikrokator to your measuring problem.



Graduated-.0001" to .00001". Graduated-.001 mm to .0002 mm.

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POWERFUL PRESSES THAT USE NO POWER

ARBOR PRESSES FOOT PRESSES

Famco Arbor Presses deliver 1,000 lbs. to Famco S 15 tons pressure, need no wires, motors, line shafts or power. Widely used with girl operators for assembly and dismantling jobs. All 32 stock sizes, bench and floor types, are easy to operate, take small space, ruggedly built yet readily portable. FAMCO MACHINE CO., 1320 18th St., Rucine, Wis.



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Production Capacity

We are now in position to take on some additional work. Our plant is ultra-modern with finest equipment. Our staff has had more than 34 years of experience in management, engineering, designing and production - skilled in handling war contracts for large firms—quickly and efficiently.

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PROTECT prints and shop orders from grease and dirt.

Time wasted is money wasted. Transparent Envelopes save time. They keep costly charts, orders and tickets clean and readable throughout the job. They eliminate extra prints, etc. They're durable, non-inflammable and soon pay for themselves in time saved. Write for a sample and information.

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Sizes ½' to 4' Pipe

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JAS. A. MURPHY & CO.

All Perkins Swivel
Vises swing 360
degrees and have complete circle graduations. All Angle Vises raise 92 degrees.

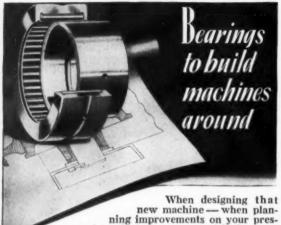
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SWIVEL ANGLE

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rate McGILL Solidend MULTIROL Bearings.
McGILL Solidend MULTIROL Bearings have fewer parts, thus making assembly into your product quick and casy. Means for perfect lubrication is provided. The rounded-end rollers give greater load carrying capacity for any given bearing width. Perfect sealing keeps out dirt and makes for longer life and free-running operation. Provision for incidental end thrust is provided. They can be used with, or without, the inner raceway . . . mounting them direct on to the shaft.

Bulletin SM-42 gives complete information. Write us about your possible requirements.

BEARING DIVISION - 1700 N. Lafayette St.

MCGILL MANUFACTURING CO., INC. VALPARAISO, INDIANA

PLUG GAGES

In the making of plug gages, it is evident that it is not only important to make them to a very high degree of accuracy, but also to make them of a material that will remain accurate for the greatest length of time. This is only another way of saying that they should be made of a steel that is highly resistant to abrasive and other wear, whether it is a standard plug gage that is being considered, a tapered plug gage, or one of some special type.

Among the many tool steels on the market, there are some that are especially recommended for plug gages. There are at least two tool steel supply houses, that can supply two different tool steels well adapted to this use.

It is naturally to be expected that when any firm is specializing on some particular kind of work or products in connection with which plug gages are used, that they would be interested in furnishing gages of that particular type.

Thus, we find that one firm, long specializing in a line of taps and dies, is in position to furnish accurate and reliable plug and ring thread gages, in all types and sizes.

On the other hand, there are firms which enter in to plug gage making simply from the standpoint of being tool and die specialists. One such firm makes gages to precision measurements, in addition to a line of fixture and location gages.

The use of tungsten carbide for the gaging surfaces of

gaging surfaces of manufacturers. One firm that has perfected a special type of tungsten carbide alloy has made profilometer tests on such gages. After lapping them to a mirror finish, close tolerances, etc., they claim tests showed the gaging surfaces to have a maximum variation of less than 0.000-0006". Such gages maintain their size and accuracy longer than steel, and longer even than chrome-plated gages.

Further, since tungsten carbide has a much lower co-efficient of expansion than steel, such plug gages are naturally affected less by variations in temperature.



ALL MACHINE SHOPS NEED DIAMONDS

Chicago, III.

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The Chisel Point Diamonds for Radius Dressing out-wear pin point diamonds 50 to 1. As illustrated above in 3/4 holder. Price \$6.00. Send for Booklet B.B.

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Balance

YOUR Grinding Wheels



Your wheels can be balanced easily, quickly and accurately with this complete, inexpensive kit. A big improvement in your

grinding finishes is bound to result.



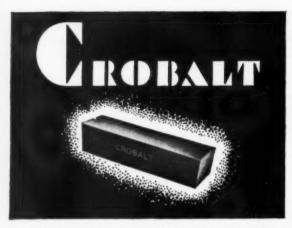
For the whole story, write for illustrated booklet "T".

POPE MACHINERY CORP.

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A NON-FERROUS HIGH SPEED CUTTING ALLOY WITH THESE ADVANTAGES:

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- Available in solid tools or inserts
- Requires no change in equipment

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ELECTRONIC APPLICATIONS

"If the power output of all the radio stations in this country—both short wave and standard broadcasting—were added together, they would total only half the power output of Westinghouse high frequency oscillators now electronically finishing tin plate," according to D. D. Knowles, Manager of Electronic Engineering for Westinghouse Lamp Division.

"Use of radio waves to flow metals on surfaces is only one of approximately 50 major induction heating applications of electronics which probably will be used widely after the war. "The electron, tiniest particle of matter known to man, is
the 'work horse' of
wartime industry.
Electronics—in all its
multitude of uses—
is a determining factor in winning the
war, not merely a
science of the future.

"Electronic devices per mit large-scale production of magnesium and aluminum and permit power lines to carry more electricity. Thru electronics, we can look into a massive slab of armor plate to spot flaws beneath the surface; we can analyze complicated gasses used in making synthetic rubber.

Industrial electronics is growing fast and is today a large industry. Probably half a billion dollars worth of business has been done in the industrial field in the last three years, excluding radio and communications. This makes it a big business' even today.

An electronic device, called the Precipitron, is busy insuring clean air for plants making binoculars, bomb-sights, precision air craft parts and delicate in-

struments. After the war, it will help keep the homes spotless. Dust particles drawn into the Precipitron are given a negative electrical charge, then pass on to be collected on positively charged metal plates. This method removes up to 95 per cent of the dust and dirt in the air, even tiny specks of tobacco smoke a quarter of a millionth of an inch in diameter.

Without moving parts, the Ignitron converts a-c into d-c required for production of magnesium and aluminum. In welding, the Ignitron makes possible the "stitching" together of these metals which it helps to produce.

FLEXIBLE COUPLINGS

· SIMPLE

· STRONG

· POSITIVE

Correction of misalignment, absorption of shock and vibration. Noiseless. Requires no lubrication.

Type "IA"

Only 3 parts. 1/6 to 50 h.p. Most widely used coupling.



Pat. and Pats. Pending.

Send for catalog of full line to 2500 h.p. duties. Quick-finding Selector Charts.

LOVEJOY FLEXIBLE COUPLING CO. 5026 W. Lake St., Chicago 44, III.

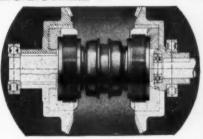


How PULLMORE CLUTCHES Obtain Forward and Reverse Speeds

SEND FOR THESE POWER TRANSMISSION BULLETINS

They show and describe how the PULLMORE Multiple Disc CLUTCH is applied to obtain for-

ward and reverse speeds — while the input shaft rotates continuously in one direction. Contain helpful application diagrams. Give dimensions and specifications. Tell how many exclusive PULLMORE features are being used to design ahead-of-competition products.



EDISON PLACE NEWARK 5, N. J.



Rockford Drilling Machine Division Borg-Warner

1309 Eighteenth Avenue, Rockford, Illinois, U.S.A.





GAGE BLOCKS

With demands for precision increasing constantly, the importance of a good set of gage blocks in the shop is greater now than ever before. And the accuracy that is being incorporated into gage blocks today is really something to consider.

Limits to within .000008" are held by some manufacturers, and one need not purchase an entire set of blocks if he finds his real needs are covered by less, for they are sold separately.

With reference to small sets, these are obtainable in some places, also accurate to 8 millionths. One such set has nine

standard blocks, and with it an optical flat may be obtained, if desired, packed directly in the same case with the gage blocks. The blocks in the set begin at .0625 and range upward to 2" for the thickest, the ones in between being such as to offer the greatest possible versatility and scope in handling.

In some plants where gage blocks are manufactured, more rigid conditions are maintained than one would at first believe. We naturally think of such blocks being hardened, ground, seasoned and lapped with the very latest and most perfect equipment available, and under the supervision of experienced gage engineers.

But in one such plant at least, there is carefully maintained an exact 68-degree F. temperature room, where all the final manufacturing operations on gage blocks are performed. Thus, there is not the slightest chance for temperature variations to introduce even infinitesimal errors by

troduce even infinitesimal errors by causing expansion or contraction of the metal. Blocks are made of tool steel by this company.

Something outstanding and new has recently made its appearance in the gage blocks field, for now gage blocks are being used for the measurement and determination of angles, as well as thickness dimensions. Angle gage blocks, so-called, are now available in a set of only 14 blocks. Regardless of the fact that there are only 14 of them, they can be wrung together and combined to yield any desired angle from 0 degrees up to 103 degrees, in steps of only one second.

Mark It Quickly with a NUMBERALL



TROYKE ROTARY TABLES



Sizes 9", 12", 15" and 18".

Ask your dealer or write us for eight page catalog.

ALFRED A. TROYKE

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DIMENSIONS

Overall Height ...4½"
Overall Width ...6¾"
Overall Length ...7½"
Maximum Opening ...2"

Net wt. complete with 4 hold down bols: 76" diameter, opproximately . . . 36 lbs.
PRICE: F.O.B. FACTORY, \$65.00

ACCURATELY centers and aligns work for milling, drilling, shoping, etc. Once seel is castered to jurse, work in outenotically gentered since host jurse operate simultanequally. Centering is useffected by variotions in stack thickness. Work is gripped evenly and tesselously with parallel, severated, burdened steel jurse. All costings special, high grade semi-steal, "burded up" for quiter rigidity and strength. Worky allay ploal screw hardened for long life.

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Manufacturers of the DIAMOND Line of Precision Milling Moshines and Accessories



THE SLIGHTEST DIFFERENCE IS ALL THE DIFFERENCE

Try to imagine industry deprived of the methods by which interchangeable manufacture is made possible on its present scale—that is the only way in which you could conceivably evaluate precision in its Schrillo meaning.

Maintenance of exactness in dimensions is the sine qua non of modern mass production. And the most infinitesimal measurements may determine the difference between losses and victories on the fighting front.

Precision of design and manufacture are exemplified in the Schrillo line, which includes: Thread and Cylindrical Plug and Ring Gages; also Special Gages; Taps, Counterbores, Countersinks, Micrometer Adjustable Stop Countersinks, Special Cutters, and Angle Drives. Specify Schrillo when precision must mean perfection.

Schrillo Aero Tool Engineering Co. 8715 Meirose Avenue • Los Angeles 49, Cal.



HOBS

Hobs are purchased by many users from manufacturers that specialize in high speed production tools of all kinds. These makers, as a general rule, endeavor to grind all the hobs they manufacture, for grinding hobs to a finish insures that all distortion, produced in hardening, will be eliminated.

One firm that has made much advancement in the involute spline system, furnishes ground hobs to the trade, as desired.

With particular reference to the hob-

bing of splines, this firm points out that hobs for involute splines can be manufactured to closer tolerances than hobs for square keys, because straight tooth profiles are used. Further, with top grinding, only 29 hobs are required for cutting 285 standards.

Regardless of the fact that some tool makers do not make any unground hobs, due to certain drawbacks of such hobs, there are a considerable number that use them, and one manufacturer of hobbing machines and hobs to use with them, will furnish hobs either ground or unground.

This manufacturer. however, is careful to differentiate between the two types of hobs, even to the extent that he uses blue boxes for packing ground hobs, and green boxes for packing those that are not ground. Hobs for special forms, spur gears, special preci-sion small gears, spiral gears, sprockets, spline shafts, square shafts, taper splines and ratchets may all be obtained from this company.

A tool steel with a certain amount of chromium is usually preferred for the manufacture of hobs, tho the chromium content may vary widely, depending on the steel analysis in its entirety.

There is one tool steel manufacturer who has at least three different steels which are recommended for hobs. One of these contains 12% chromium, another 1%, and the third only .50%, but the balance of the analyses is such that all are very good for the purpose.

The making of worm gear hobs is a particular job.

STERLING DRILL GRINDER



EAU CLAIRE WISCONSIN, U. S. A.



Resharpen **Dull Taps**

Easily! Quickly! Accurately!



READING TAP GRINDER

Can be used on almost any type of tool and cutter grinder, surface grinder—even bench lathes. Tap is held in chuck—may be sharp-ened after center is destroyed. No collets. Complete. No extras. Write! • Built-in c h a mis er • Easy - to - follow

Built-in protractor. Simple shifter for 2-3-4 flute taps. thru adjustment

chamfer diagram on index plate.

· Capacity to 3/4" hand tap.

ORDER NOW!

Also manufacturers of READING BROACH KEYSEATER

The Reading Bench Machine does not require bushings or quides. No other machine like it. Very fast capacity from 1/8 to 3/8 cutter. Low first cost - prompt delivery.



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GITS
Wick Feed Oilers

Wick Feed Oiling is the cleanest method of lubrication you can get—no foreign matter or dirt can be transmitted through the wick to the bearing. It can be varied to supply just the right amount of not-too-heavy oil at any one of several locations on each bearing whether it be vertical or angular position; high, low or intermitted in speed. Gits Wick Feed Oilers are available in a wide range of styles, sizes and materials. Ask for complete information on this type of oiler.



Gits Catalog No. 60 gives you 172 pages of Oiler, Oil Seal and Lubricating Device information... Write for it.

have been used in the past, because they never throw grit or dirt directly into their faces.

One portable sander of this type is eq uipped with a cushion drive that absorbs shocks and vibrations, not only making the work easier on the machine itself, but still further reducing operator fatigue.

Another one has been observed in use for sanding down the edges of tanks used in making bottle washing machines. It has both the light weight and the high sustained speed necessary to make it it de al for all such types of sanding.

Sanders of portable disc type, as made by some manufacturers, come in a number of sizes, suitable for carrying sanding discs anywhere from 4" to 9" in diameter, and may be obtained in both pneumatic and high-frequency electric models, so it can be seen that there is a very full opportunity to obtain machines for just the type of work one has to do.

duty, right angle, portable disc sanding machines is quite highly versatile, in that they can be used in connection with standard abrasive discs and also with wire brushes of a type adapted for use with them, and with cup-type grinding wheels. This adapts them for a great many duties that a disc sander strictly as such, cannot handle.

While portable sanders of the types mentioned can be and are used in connection with finishing machine tools, etc., there is another style of sander which has an electrically driven, reciprocating pad. It produces a very smooth surface.

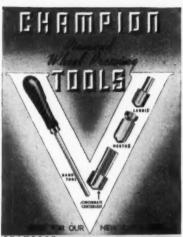
GITS BROS. MFG. CO.

1860 South Kilbourn Avenue • Chicago 23, Illinois

Exclusive for over 35 years

PORTABLE SANDERS

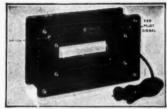
The efficiency and general utility of various types of portable sanding units in the metal working industries, both in connection with smoothing directly as such, or in the application and smoothing down of finishing coats, is being realized more and more. In many cases, it is the disc-type sanding unit that is used, equipped with a right-angle head that allows the disc to be brought into proper contact with the surface being smoothed, without undue fatigue on the part of the operator. Operators like these machines better than some other types that



13 YEARS EXPREMENCE DIAMOND COMPANY - SEN YORK INDUSTRIAL DIAMONDS AND DIAMOND PRODUCTS

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AMC DEMAGNETIZER A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only \$32.50, complete as shown,

Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.



ONLY
\$4200

Complete
QUICK SHIPMENTS
ON AA-5 PRIORITY
OR HIGHER

NEW SAW-GUN

SAWS and FILES where no other tool can reach!

* Now, many hard-to-get-at sawing and filing jobs that formerly required hours of time and the use of several tools, can be quickly handled with one tool—the SAW-GUN.

Propelled by electricity, compressed air or flexible shaft, this new tool will rapidly saw or file light and heavy gauge metals of every description, corrugated or plain. It's ideal for panel notching in metal, wood, plastics and other materials. In fact, the Saw-Gun may be used advantageously in a wide variety of applications.

Sold on money-back quarantee.

See Your Jobber or Write Direct for Quick Delivery!

MID-STATES EQUIPMENT CO. 2435 So. Michigan Ave. (SAW-GUN DIVISION) Chicago, III.



The **RIGHT** Speed With Complete Portability

Onsrud Air Turbine Grinders provide speed and power never before achieved in tools of their size and weight. The three types shown here are the B-1, 75,000 RPM; the MD-1, 50,000 RPM; and E-1, 38,000 RPM.

At any of these speeds, you get vibration-free operation, continuous cool running, no damage from "stalling" and ample power for the job. All these Onsrud tools are light in weight and easy

to handle.

Complete details on these practical high RPM tools that provide surface speeds at which small grinding wheels work best are yours for the asking. Write today for special Grinder Bulletin.

ONSRUD MACHINE WORKS, INC. 4
3908 Palmer Street Chicago 47, Illinois



MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

BENCH TOOLS

There are two different economic aspects of bench tools that are of intense interest to plant owners everywhere. One of these is the fact that good bench tools are excellent standby equipment, enabling the shop to get out many relatively small and lightweight jobs promptly, when the larger equipment is tied up on a long run, or when it is too busy to handle them.

The other is the indisputable fact that power is wasted whenever a very large machine is used to do a very small job. Consider, for instance, a little bench type punch press requiring only ½ hp for operation at the maximum. It is obvious that in shops having a liberal supply of very light work mixed with their punch press operations, little machines of this kind can do much to speed the work in general.

One can even use hand - operated punch presses in some cases to excellent advantage. These are readily portable, and may therefore be carried from bench to bench.

Bench profiling machines are extremely handy for many small recessing and slotting operations, and save setting up a larger machine, or taking it from larger work.

We all know the extent to which bench lathes have helped on small odd jobs of turning, and there are many shops which would not think of being without them.

Bench shears are available in different sizes for different weights of metal, and have played an interesting part in speeding operations on light shear work in a great many different places, on ordinary trimming and cutoff work.

One firm of which I know, in addition to offering a highclass bench-type, hand-operated shear, also provides a little brake and a special bender, the three machines being designed to work together in such manner as to make possible the forming and duplication of metal parts, without having recourse to dies for the purpose.

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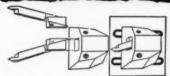
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THREAD GRINDING

In the grinding of threads, it is obvious that a grinding wheel must be used which has a finer grain size than required for most grinding. That is so the wheel may be trued to produce a truly sharp edge, and also that the finish obtained on the threads may be sufficiently accurate. It is just as obvious that the finer the threading being ground, the finer must be the grain in the wheel being used.

One of the leading manufacturers of grinding wheels recommends a 100-grit wheel for grinding threads from 12 pitch

and versatile thread grinding machines. One of these, in particular, has developed such a machine that is remarkable for its scope. Consider a thread grinding machine that will hold workpieces up to 12" diameter and 115" in length between centers, and that will grind a threaded portion of that part up to 68" long.

One machine, when desired, can take care of the grinding of internal threads up to 91/2" diameter. This firm, in fact, makes a full line of thread grinders.

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have specialized in many different

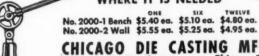
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GEAR FINISHING

Whatever differences of opinion may exist among production men as to the best method of finishing gear teeth, the idea of simply "running gears in," with lapping compound put between a pair of mating gears, has been disqualified, unless it be with the idea of using an extremely fine abrasive simply to impart a high polish. Such a process certainly cannot be considered as corrective of any errors that might exist.

Gear shaving is being practiced more and more as a means of correcting any hobbing errors that may exist in the gears prior to hardening.

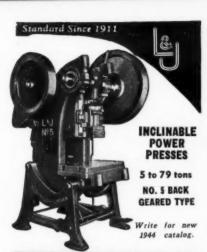
A manufacturer of gear shaving machines that has pioneered in this field, has developed a process of running a spiral gear along a straight rack for shaving the teeth of the spiral gear. and of traversing spur gears along an angular rack. has been building machines to take care of larger gears continually.

The angle of the rack with the teeth of the gear gives a sort of sliding motion, and since the teeth of the rack are hardened and serrated, they have a lot of tiny cutting edges that remove very small shavings from the gear teeth during the process. In hobbing the gears. they are left a bit oversize, in order that this corrective process may be applied.

The largest machine for gear tooth shaving now being made by this firm will handle gears that are four feet in

diameter, and up to 20" wide across the face. Yet a gear that is only 4" in diam-eter may be handled. The smallest ma-chine made handles gears from one to

24" in diameter.
Another firm makes a gear shaver, which uses as a cutter what is really a hardened gear of the correct form desired. with a groove milled around its circumference, down thru the center width of the teeth. By running the two together (the cutter and the gear to be shaved) and providing axial motion during the process, the sides of the central groove in hardened cutter shave gear to form.



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SURFACE GRINDERS

In some plants, where it has been decided to install surface grinders, it is almost a toss-up as to whether rotary types will be used, or reciprocating machines. Where there is a great deal of circular work to be ground, the rotaries generally will be better.

If there is insufficient work to justify both types, all that can be done is to study the entire shop situation carefully and determine which machine will give the better results.

Some of the rotary surface grinders now being used in war production, grinding cam faces for Cyclone engines, have the grinding spindles mounted on double-row preloaded ball bearings, insuring that no play will develop to reduce the accuracy of operations. These are horizontal spindle machines.

Some rotary surface grinders of competent design are fitted with vertical spindles. The idea of such machines is to permit the use of cup wheels. Usually it will be found that parallels, washers. small flat dies. punches, spacers chasers, etc., can be ground faster and more economically on such a machine, if it is designed specifically for the work. One machine of this type, equipped with a rotating magnetic chuck, is especially well adapted for this kind of grinding.

Modern surface grinders of reciprocating table type are proving to be important in reducing working hours on many different kinds of jobs.

Especially in the case of large machines provided with hydraulic drives for table and wheel traverse, many massive base castings and similar jobs are being directly ground to precision finish. This eliminates a great deal of hand scraping that previously had to be performed. The spindles on these machines are so rigidly mounted that interrupted surfaces are held to very close limits of accuracy.

One manufacturer provides such machines with twin cylinder hydraulic drives for the tables. The layout gives equal traversal speed in both directions, and the drive is fully cushioned.



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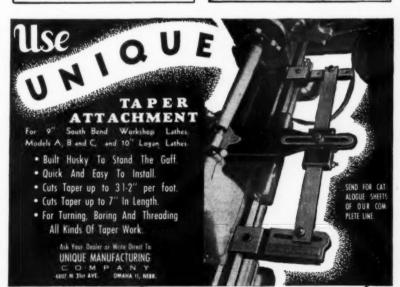


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Some of the modern plain grinders. while made very simply, incorporate rigidity and accuracy. One line of these grinders is fitted out with what is called a Speedmaster drive, which allows a 6 to 1 speed variation. both on the headstock drive and on the table traverse movement. Ability to control both the rotary and the traverse speed of the work makes it possible to obtain just the kind of finish that may be necessary or desirable on a given job.

Of course, when one speaks of finish on cylindrical work. there is inevitably another phase that must be considered. and that is the cylindrical grinding wheels that are being used. Time studies made with different wheels in operation have often shown that one wheel is far su-perior to another on a given job, tho the purchase price of the wheels may be just the same.

Some grinding wheel manufactur-

ers offer consulting engineering service in this regard. Others publish booklets of grinding wheel specifications, which show the types and sizes of wheels applicable to any specific kind of grinding machines. This is very helpful to supervisors.

Much greater scope in plain grinder table speeds than the ones mentioned, is available when the table of a machine is operated hydraulically. One outstanding plain hydraulic grinder handling up to 6" diameters, has a twin-cylinder table traversing mechanism that is actuated by a Tuthill internal geared oil pump.

CYLINDRICAL GRINDERS

For the benefit of the uninitiated, it might be said that cylindrical grinders divide into two different types, known as plain and universal grinders.

The universal cylindrical grinder incorporates certain adjustments for the grinding wheel and for the grinder headstock which allow a greater variety of work to be performed. However, from the standpoint of the production man who has a lot of plain cylindrical work to do, the extra features on a universal grinder mean nothing but additional cost.



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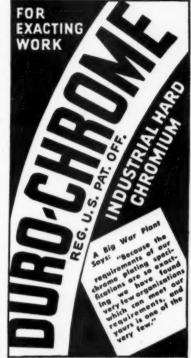
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REAMER STEELS

Much progress has been made in extending the life of reaming tools, since application of better steels to their manufacture. Study has shown that many fine steels are now available for this purpose, and their composition is quite interesting.

One high speed steel that has been found good for this purpose contains 18% of tungsten, 4% chromium and 1% vanadium. The carbon range in this type of steel may be as specified. It has, of course, a great many other uses than the making of reamers. Greater toughness is obtained by holding the carbon range to

a lower point in this steel.

Another steel made by the same firm is also applicable for reamers. It has the same composition as the steel mentioned except that the vanadium content is increased to 2%.

This increase in the vanadium content has two different practical effects. First, in its own right, it gives a steel from which somewhat better results in general can be expected than from the 18-4-1 type mentioned. Also, a greater proportion of carbon can be used with impunity, for where the vanadium is being increased, carbon can also be increased without sacrificing any great amount of toughness. Vanadium has a very high affinity for carbon.

Where the reaming of cast iron is involved, a steel having a generous content of cobalt has been found excellent. In fact, such a steel is good for the cutting of

any material which has a discontinuous chip, including various non-ferrous materials. However, it is just a trifle more brittle, and does not leave quite so high a finish on the cut. By taking an 18-4-1 steel of the type outlined in the first paragraph, and adding to it about 4.50% cobalt, a tool steel has been produced which is especially suitable for reamers that are used in reaming piston pin holes in cast iron, reaming motor cylinders, and similar work.

There are also some excellent high speed tool steels in which molybdenum has been substituted for tungsten.



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SEND \$1.00, giving us size of your arbor, and we will send you a special trial assortment of spacers, sufficient for average use on a machine.

DETROIT STAMPING CO

CONTROLLING STATIC

Science is out to lick static electricity and reduce fire hazards in the nation's synthetic rubber tire industry. Some hints on dealing with the wayward cousin of man's most obedient servant, electric current, were given members of the rubber section of the Ohio Safety Congress recently by G. W. Penney, Manager of the electro-physics department, Westinghouse Research Laboratories at East Pittsburgh, Pa.

Synthetic rubber tire makers are disturbed by fires on tire fabric production

lines, most of them blamed on the igniting of highly volatile rubber cement by static elec-tricity. The elec-tricity is generated in the unrolling of layers of treated cotton or rayon tire cords, which are separated by canvas liners, and it accompanies the cords as they go into successive process which involves the use of rubber cement. Considerable hazard is involved in the process.

Impregnating of the canvas cloth rolled between the cord layers was advocated by Mr. Penney as the most practical method now known of reducing the fire threat on these tire production lines. Other methods, he said, have proved insufficient or have interfered with the efficiency of the manufactures.

Static electricity, the engineer explained, is created when friction causes electrons to be rubbed from the atoms in one object and adhere to an object of different

c haracteristics. Such electrons are not very active and soon spend themselves, but while present are highly dangerous around volatile or explosive materials.

"Artificially-created humidity in the factory helps to eliminate the formation of static electricity," Mr. Penney said, "but it affects the quality of the tires. Ways of neutralizing the static electricity have proved impractical. Grounding of the machinery parts is only partially effective. It would seem, then, that impregnation of the liners which are used over and over will prove most practical."

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SAW SHARPENING MACHINES

Possibly the power hacksaw blade is abused more universally, in the sense of being used when dull, than any other form of metal-working tool. This is due in some measure to the fact that it is not expected to make a finish cut. Also because always operators try to get a bit more work out of it. Chiefly tho it is due to lack of proper facilities for sharpening power hacksaw blades. Some shops have sharpeners that handle other types of saw blades. Generally these are not adapted

for keeping power hacksaw blades in condition. In some plants, happily, this condition has been overcome by installing power hacksaw blade grinding fixtures, which allow accurate regrinding when necessary.

There are some saw sharpening machines in use in metal - working plants, however, that regrind band and circular saw blades and power hacksaw blades as well. These are often of bench type, and are excellent for taking care of the needs of small and medium sized shops.

As made by one manufacturer, they will automatically sharpen saws with teeth as fine as 32 per inch. If and when such a machine becomes overloaded with work, it can be relieved readily by using nearly any kind of special-purpose saw sharpener in addition.

Full automatic generation of various kinds of saw tooth shapes may be obtained in connection with saw

sharpening on some of the metal saw sharpeners now being used. Cams mounted inside machine base provide this automatic generation.

The grinding of bevels on alternate saw teeth is also automatic on these machines. Such machines are intended chiefly for circular saw sharpening. The same firm building them also has other types of circular saw grinders that will handle blades anywhere from two to 10" in diameter, with tooth-spacings up to 5%" from point to point.

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FEATURES

Front Operated Recline • Timken Roller Bearing Flywheels • Frame-Anchored Knockout Bracket • Symmetrical Rams • Longer "V" Ways and Gibs • Oversize Crankshafts • Non-Repeat Clutch Mechanism • Safety Latch Spring alloys. One is copper and nickel (Monel) and the other molybdenum, nickel and iron (Hastelloy).

An atom may be thought of as a nucleus around which revolve, somewhat in the manner of planets around the sun, from one to 92 electrons. These move in from one to seven different orbits or shells.

Ordinarily on e shell is filled with electrons before the next orbit begins, tho in the case of certain "transition" elements there are vacancies in the shell next to the outer one.

In nickel, for example, there are only 8 electrons in the third shell, instead of the 10 it could hold, despite the fact that there are two electrons in the fourth and outermost shell. With inner shells completely filled, a metal is more subject to corrosion.

Because of the vacancies, nickel is very resistant to corrosion, but it is too expensive for

many applications, and so it is alloyed with copper which is lower in cost. The atom of copper has one more electron than that of nickel. In the alloy these extra electrons go to fill the vacancies in the nickel atom. However, as long as any vacancies remain in the nickel, the alloy still resists corrosion as well as pure nickel.

Finally, when the proportion of 60 per cent copper and 40 per cent nickel is reached, all the nickel vacancies have been filled. Further increasing the proportion of copper makes the alloy less resistant until pure copper is reached.

RUST RESISTANCE

Vacant spaces in the atoms of nickel are responsible for its resistance to corrosion or "rusting". Dr. Herbert H. Uhlig, Metallurgist of General Electric Research Laboratory, recently told the Electrochemical Society.

In earlier researches, he found that the stainlessness of stainless steel is not due primarily to the formation on the surface of a film of oxide, as formerly supposed. Instead it results from the electronic arrangement in the atoms of the alloy. Now he finds that the same thing is true for two other widely used corrosion-resistant

THE WAY TO GREATER











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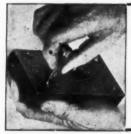


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Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.



BEVERLY HILLS, CALIFORNIA

MANDRELS

The term "mandrel" is one that may be a bit confusing to the budding mechanic. It has reference to a spindle that is held between centers in a metal-working lathe. It is used to hold a bored part, so that the outer portion may be turned concentric with the bore.

It is also applied to the revolving spindle of a circular saw, whether metalworking or woodworking.

Still further, it may mean a cylindrical piece of steel used by a blacksmith, around which he forges metal rings or other circular members. More than that, it means a shaft or piece of steel around which metal is cast and molded, and this is particularly true with regard to socalled babbitting mandrels.

With this array of facts in mind, it will be understood that some mandrels must be made of steel that is suitable for contact with hot work, while others are for cold work exclusively. That is why steel manufacturers allude at times to "hot mandrels", respectively.

Generally speaking, however, cold mandrels are by far in the majority, and it is therefore quite safe to assume that when a given steel is recommended simply for mandrels, that cold mandrels are meant.

On the other hand, the analysis of a tool steel that is being purchased is usually given, and when a steel has a generous chromium content,

it is quite safe to use for hot work if the carbon content is not too high. There may even be considerable carbon if the other ingredients are right.

There is one steel, for instance, that contains 13% chromium and 1.40% carbon. Despite the relatively high carbon content, the analysis of this steel is such that is safe to use on hot work not exceeding 1000° F and it is recommended for mandrels.

Some manufacturers of tool steels have a number of selections suitable for cold mandrels.



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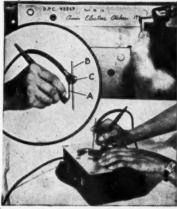
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every bit of "jewelry", as they call the external gadgets comprising the electrical and carburation systems, springs, valves and tubing. In a short time, only the bare blocks remain.

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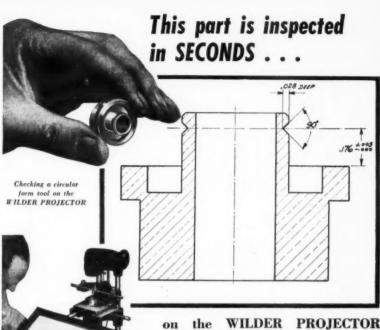
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The part shown here is typical of the wide variety of work that can be checked on the WILDER PROJECTOR. In this specific case, three dimensions including an angle can be inspected in one operation. The work piece is quickly located on a simple fixture and checked against a drawing. Errors, 12½ times magnified, show up on the screen in front of the operator.

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- 5. It facilitates the control of tool wear through periodic inspection of parts in process.
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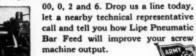
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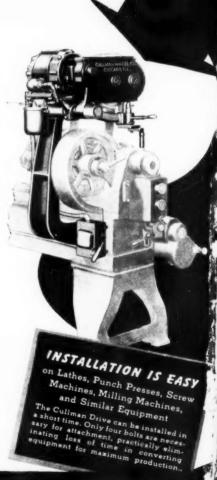
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